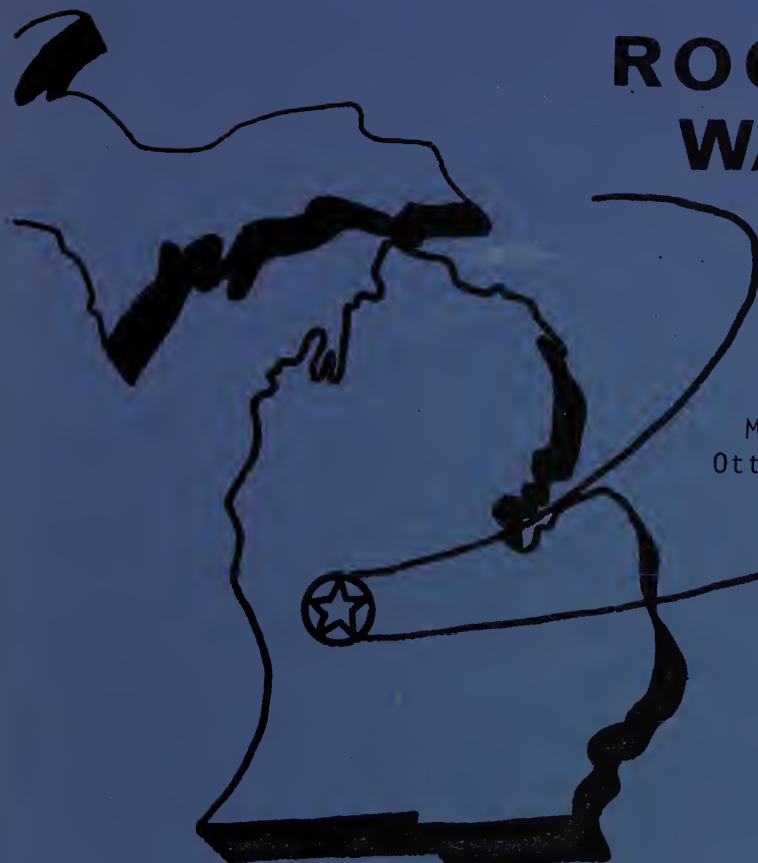


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ROGUE RIVER WATERSHED



State of Michigan

Newaygo County
Kent County
Montcalm County
Muskegon County
Ottawa County

FINAL WATERSHED PLAN AND FINAL ENVIRONMENTAL IMPACT STATEMENT

JULY 1975

Prepared By

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
East Lansing, Michigan
WITH COOPERATION FROM
MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WATERSHED PLANNING SECTION

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FINAL WATERSHED PLAN

AND

FINAL ENVIRONMENTAL IMPACT STATEMENT

ROGUE RIVER WATERSHED

Newaygo, Kent, Montcalm, Muskegon, Ottawa Counties, Michigan

Prepared Under the Authority of the Watershed
Protection and Flood Prevention Act (Public
Law 566, 83d Congress, 68 Stat. 666) as amended
and in accordance with the National Environmental
Policy Act of 1969, Section 102(2)(c), Public
Law 91-190.

Prepared By:

Newaygo Soil Conservation District
West Kent Soil Conservation District
East Kent Soil Conservation District
Rogue River Inter-County Drainage District
Centerline Drain Drainage District
Danials Creek Drain Drainage District
Walters Drain Drainage District
West Branch Drain Drainage District
Kosten Drain Drainage District
Algoma Township
Plainfield Township
Sparta Township
Tyrone Township
City of Rockford
Village of Sparta

With Assistance By:

U. S. Department of Agriculture, Soil Conservation Service
U. S. Department of Agriculture, Forest Service

JULY, 1975

ADDENDUM

Rogue River Watershed

Discount Rate Comparison

This addendum shows the effect of evaluating the structural measures using a $6\frac{1}{8}$ percent discount rate, 1974 installation costs, current prices for values other than agricultural products and current normalized prices for agricultural products.

Average annual costs, benefits, and benefit-cost ratio are as follows:

1. Average annual cost	\$ 143,190
2. Average annual benefits	\$ 640,235
3. Benefit-cost ratio with secondary benefits included	4.5:1.0
4. Benefit-cost ratio without secondary benefits	3.7:1.0

July 1975

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WATERSHED WORK PLAN AGREEMENT

between the

Newaygo Soil Conservation District
West Kent Soil Conservation District
East Kent Soil Conservation District
Rogue River Inter-County Drainage District
Centerline Drain Drainage District
Danials Creek Drain Drainage District
Walters Drain Drainage District
West Branch Drain Drainage District
Kosten Drain Drainage District

Algoma Township
Plainfield Township
Sparta Township
Tyrone Township
City of Rockford
Village of Sparta

(hereinafter referred to as the Sponsoring Local Organization)

State of Michigan

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan of works of improvement for the Rogue River Watershed, State of Michigan, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Rogue River Watershed, State of Michigan, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about five years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organization will acquire without cost to the Federal Government such land rights as will be needed in connection with the works of improvement. (Estimated cost \$273,150.) The costs to be borne by the Sponsoring Local Organization are as follows:

<u>Works of</u> <u>Improvement</u>	<u>Sponsoring</u> <u>Local</u> <u>Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated</u> <u>Land</u> <u>Rights Costs</u> (dollars)
---------------------------------------	---	-----------------------------	---

STRUCTURAL MEASURES:

Multiple-Purpose Channel Improvement

Rogue River	100	0	103,170
Centerline Drain	100	0	37,910
Kosten Drain	100	0	35,770
Danials Creek Drain	100	0	21,000
Walters Drain	100	0	22,440
West Branch Drain	100	0	13,260

Multiple-Purpose Pumping Station

Rogue River	100	0	3,600
-------------	-----	---	-------

Flood Prevention Measures

Danials Creek Drain			
Debris Basin	100	0	3,600
Streambank Protection	100	0	21,000

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat, 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	35.5	64.5	0 ^{1/}

- 1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.
4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Construction Cost</u> (dollars)
Multiple-Purpose Channel Improvement			
Rogue River	4.0	96.0	607,490
Centerline Drain	4.0	96.0	99,790
Kosten Drain	4.0	96.0	125,840
Danials Creek Drain	4.0	96.0	73,900
Walters Drain	4.0	96.0	59,070
West Branch Drain	4.0	96.0	34,910

Multiple-Purpose
Pumping Station

Rogue River	4.0	96.0	282,000
-------------	-----	------	---------

Flood Prevention Measures

Danials Creek Drain			
Debris Basin	0	100	28,000
Streambank Protection	0	100	66,300

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organizations and the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Engineering Cost</u> (dollars)
<u>Structural Measures:</u>			
Multiple-Purpose Channel Improvement			
Rogue River	0	100	60,760
Centerline Drain	0	100	9,980
Kosten Drain	0	100	12,580
Danials Creek Drain	0	100	7,390
Walters Drain	0	100	5,900
West Branch Drain	0	100	3,490

<u>Works of Improvement</u>	<u>Sponsoring Local Organization (percent)</u>	<u>Service (percent)</u>	<u>Estimated Engineering Cost (dollars)</u>
Multiple-Purpose Pumping Station			
Rogue River	0	100	28,200
Flood Prevention Measures			
Danials Creek Drain			
Debris Basin	0	100	2,800
Streambank Protection	0	100	6,630
<u>Non-Structural Measures:</u>			
Rogue River Floodplain Management	0	100	31,500

6. The Sponsoring Local Organization and the Service will each bear the costs of Project Administration which they incur, estimated to be \$83,895 1/ and \$137,790 respectively.

1/ Includes \$15,000 to develop flood plain zoning ordinances and implement flood plain management programs.

7. The Algoma, Plainfield, Sparta and Tyrone townships, the city of Rockford and the village of Sparta will develop and implement a flood plain management plan consistent with the results of the flood plain delineation.
8. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.
9. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.
11. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.
12. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties. An amendment to incorporate changes affecting one specific structural measure may be made by mutual agreement between the Service and the sponsor(s) having specific responsibilities for the particular structural measure involved.
14. No member of or delegate to congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

15. The program conducted will be in compliance with all requirements respecting non-discrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.
16. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Newaygo Soil Conservation District
Local Organization

By _____

Title _____

940 West Rex

Chairman

Fremont, MI

49412

Date _____

Address

Zip Code

The signing of this agreement was authorized by a resolution of the
governing body of the Newaygo Soil Conservation District
Local Organization

adopted at a meeting held on _____

Date _____

Secretary, Local Organization

East Kent Soil Conservation District By _____
Local Organization

Title _____

3319 Plainfield, NE

Chairman

Grand Rapids, MI

49505

Date _____

Address

Zip Code

The signing of this agreement was authorized by a resolution of the
governing body of the East Kent Soil Conservation District
Local Organization

adopted at a meeting held on _____

Date _____

Secretary, Local Organization

West Kent Soil Conservation District By _____
Local Organization

3319 Plainfield, NE

Grand Rapids, MI

49505

Address

Zip Code

Title

Chairman

Date _____

The signing of this agreement was authorized by a resolution of the governing body of the West Kent Soil Conservation District

Local Organization

adopted at a meeting held on

Date _____

Secretary, Local Organization

Rogue River Inter-County Drainage
Board

Local Organization

By _____

Deputy Director in
charge of drains

5th Floor, Lewis Cass Bldg.

Lansing, MI

48913

Address

Zip Code

Title Michigan Dept. of Ag.

Date _____

By _____

Newaygo County Drain

Title Commissioner

Date _____

By _____

Kent County Drain

Title Commissioner

Date _____

Centerline Drainage District
Local Organization

By _____

Courthouse
White Cloud, MI 49349
Address Zip CodeNewaygo County Drain
Title Commissioner
Date _____Kosten Drainage District
Local Organization

By _____

Courthouse
White Cloud, MI 49349
Address Zip CodeNewaygo County Drain
Title Commissioner
Date _____Danials Creek Drainage District
Local Organization

By _____

Courthouse
White Cloud, MI 49349
Address Zip CodeNewaygo County Drain
Title Commissioner
Date _____Walters Drainage District
Local Organization

By _____

Courthouse
White Cloud, MI 49349
Address Zip CodeNewaygo County Drain
Title Commissioner
Date _____West Branch Drainage District
Local Organization

By _____

Courthouse
White Cloud, MI 49349
Address Zip CodeNewaygo County Drain
Title Commissioner
Date _____

Algoma Township
Local Organization

By _____

Title _____

11731 Pine Island Drive
Sparta, MI 49345
Address Zip Code

Date _____

The signing of this agreement was authorized by a resolution of the governing body of Algoma Township

Local Organization

adopted at a meeting held on _____

 Secretary, Local Organization

11731 Pine Island Drive
Sparta, Michigan 49345
Address Zip Code

Date _____

Plainfield Township
Local Organization

By _____

Title _____

6156 Belmont, NE
Belmont, MI 49306
Address Zip Code

Date _____

The signing of this agreement was authorized by a resolution of the governing body of Plainfield Township

Local Organization

adopted at a meeting held on _____

 Secretary, Local Organization

6156 Belmont, NE
Belmont, Michigan 49306
Address Zip Code

Date _____

Sparta Township By _____
Local Organization
156 East Division Title _____
Sparta, MI 49345 Date _____
Address Zip Code

The signing of this agreement was authorized by a resolution of the governing body of Sparta Township

Local Organization

adopted at a meeting held on _____

Secretary, Local Organization 156 East Division
Sparta, Michigan 49345
Address Zip Code
Date _____

Tyrone Township By _____
Local Organization
Kent City, MI 49330 Title _____
Address Zip Code Date _____

The signing of this agreement was authorized by a resolution of the governing body of Tyrone Township

Local Organization

adopted at a meeting held on _____

Secretary, Local Organization Kent City, Michigan 49330
Address Zip Code
Date _____

City of Rockford
Local Organization

By _____

Title _____

8 East Bridge
Rockford, MI 49341
Address Zip Code

Date _____

The signing of this agreement was authorized by a resolution of the governing body of the City of Rockford

Local Organization

adopted at a meeting held on _____

Secretary, Local Organization

8 East Bridge
Rockford, Michigan 49341
Address Zip Code

Date _____

Village of Sparta
Local Organization

By _____

Title _____

156 East Division
Sparta, MI 49345
Address Zip Code

Date _____

The signing of this agreement was authorized by a resolution of the governing body of the Village of Sparta

Local Organization

adopted at a meeting held on _____

Secretary, Local Organization

156 East Division
Sparta, Michigan 49345
Address Zip Code

Date _____

Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service

United States Department of Agriculture

Approved by:

State Conservationist

Date

WATERSHED WORK PLAN

ROGUE RIVER WATERSHED

Newaygo, Kent, Montcalm, Muskegon, and Ottawa Counties, Michigan

JULY 1975

SUMMARY OF PLAN

The Rogue River Watershed consists of 155,760 acres primarily in Kent and Newaygo Counties, Michigan. The plan is sponsored by the Newaygo Soil Conservation District, East Kent Soil Conservation District, West Kent Soil Conservation District, Centerline Drain, Danials Creek Drain, Kosten Drain, Walters Drain and West Branch Drain Drainage Districts; Algoma Township, Plainfield Township, Sparta Township, Tyrone Township, City of Rockford, and Village of Sparta; and the Rogue River Inter-County Drainage Board.

The plan consists of a combination of land treatment, soil surveys, flood plain delineation, channel work and a pumping station to reduce the problems of flooding and poor drainage in the Rice Lake Problem area and land treatment to ameliorate land management and erosion problems throughout the watershed. Adoption of the proposal would provide adequate drainage and protection against flooding up to a ten year frequency event. The project will also reduce erosion in the watershed from 4.5 tons/acre/year to 2.5 tons/acre/year, and runoff will be reduced 1 percent.

In order to meet the project objectives of improving drainage and reducing floodwater damages, the present drainage system will be modified. Structural measures planned include approximately 11.4 miles of multiple-purpose (flood prevention and drainage) channel work, 1.7 miles of bank shaping (for erosion control only), a pumping station, 7 water level control structures, and 2 debris (sediment) basins. All stream channels were previously modified in the early 1900's with additional minor clean-out of parts over the years. All of the 10.5 miles of existing channels have been previously modified. 1.8 miles have perennial flow through idle or pasture land with grasses, brush and a few trees on the banks. 3.7 miles have perennial flow through cropland with grasses on the banks. 1.3 miles have perennial flow through mixed idle and cropland with grasses and brush on the banks. 3.6 miles have intermittent flow through cropland with grasses on the channel slopes. 1.1 miles of new channel will pass through equal portions of cropland and idle land.

The project will have a significant impact on economic and social conditions, not only in the watershed, but in surrounding areas as well. Flooding in the problem area will be reduced from an average of 600 acres per year to 30. Base flows and water temperatures, however, are not expected to change. Sand bedload in the river will decrease from 10.7 tons to 2.3 tons in a one year frequency storm. Although cropping efficiency and yields will be increased on 3,286 acres of cropland, there will be a net loss of 94 acres of cropland.

Total cost of installing all project measures is \$2,831,565--\$805,200 for land treatment programs and individual practices, \$46,500 for non-structural measures, and \$1,979,865 for structural measures. The total cost will be shared \$1,827,175 PL-566 funds and \$1,004,390 to other funds.

Structural and non-structural measures will take 3 years to complete, while land treatment will be applied gradually. Sponsors will carry out recommended operation and maintenance measures which have been estimated at \$12,390 annually.

Comparing average annual benefits (\$640,235) to average annual costs (\$138,710) yields a benefits-to-costs ratio of 4.6 to 1.00.

INTRODUCTION

This document is a combined Watershed Work Plan and Environmental Impact Statement for the Rogue River Watershed. Section I of the plan has been briefed to avoid excessive duplication with information required in the EIS. Part II should be reviewed for additional information on the Planned Project, Environmental Setting, Problems, Impacts and Alternatives.

PLANNED MEASURES

Rogue River Watershed, 155,760 acres is located in west-central lower Michigan. Land use includes 30 percent cropland, 30 percent pasture and wildlife, 30 percent forest land and 10 percent other. Principal problems include flooding; impaired drainage; erosion and resulting sedimentation; and improper land use. The planned project includes conservation land treatment, non-structural measures and structural measures.

The land treatment measures planned to be installed during the project period includes practices that will adequately treat 2,140 acres of cropland, 2,420 acres of forest land, 5,150 acres of pasture and 818 acres of other land.

The Rogue River in Kent County has been designated as a country-scenic river by the Michigan Natural Resources Commission. This provides for preservation, protection and enhancement of a strip of land adjacent to the river. The Natural Rivers Plan has been coordinated with the Rogue River Watershed Project.

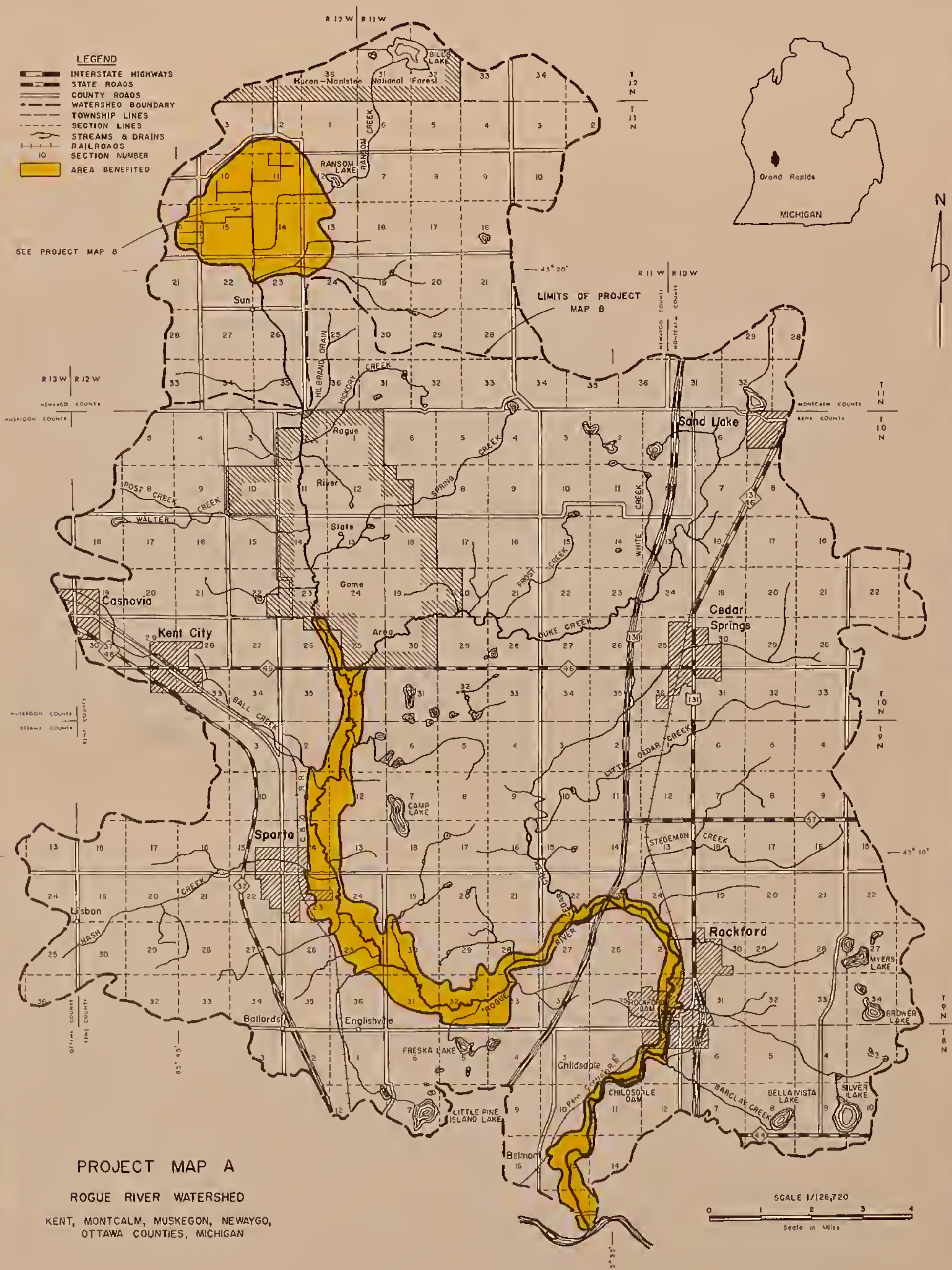
The Soil Conservation Service will provide technical assistance for the flood plain delineation for Rogue River Flood Plain Management. This will be accomplished on approximately 21 miles from the confluence of Rogue River and Grand River, Section 23 Plainfield Township, to Section 23 Tyrone Township, Kent County. This information will be used by the communities along the river as a basis for implementing statutes concerning flood plain land use and development and to provide data for the administration of Natural Rivers zoning.

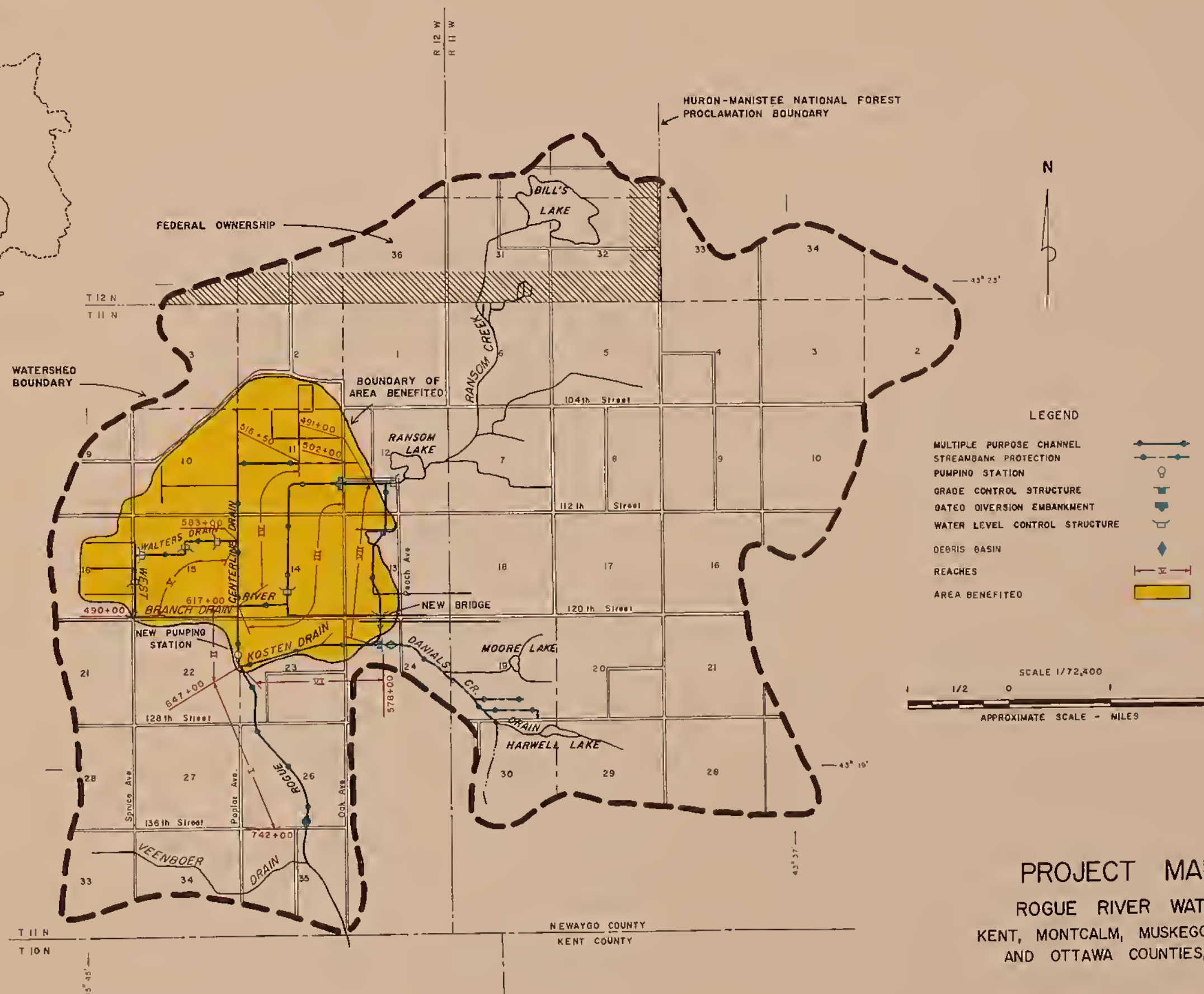
In order to meet project objectives of improving drainage and reducing floodwater damages, the present drainage system will be altered. The Rogue River through Reaches II and III (refer to project map) will no longer carry flood flows from Ransom Lake. These flows will be diverted along the east side of the problem area through Reach VII, into the Danials Creek Drain, thence into Kosten Drain and then join the Rogue River at station 647+00. A pumping station will be constructed just north of the confluence of the Rogue River and Kosten Drain in Reach II and will pump local inflow from Reaches II, III, IV, and V.

Structural measures planned include approximately 11.6 miles of multiple-purpose (flood prevention and drainage) channel work, 1.7 miles of bank stabilization (for erosion control), a 60,000 gallon per minute pumping station, 7 water level control structures, and 2 debris basins. All stream channels were previously modified in the early 1900's with additional minor clean-out of parts over the years, some as recently as February 1973. (The location of these measures are shown on the project map.) No structural alterations will be made on the Rogue River below 20 Mile Road in Kent County which is designated as a natural river.

Surface water inlets, replacement of tile outlets, and daily and permanent seeding will be provided for erosion control. Surface water inlets will be provided for nonerosive entry of surface waters into the drains. (See Figure 7.) Similarly, existing tile outlets will be replaced when damaged in construction to afford safe entry of water from subsurface drains. To counter the effects of channel scour and channel slope and berm erosion, daily seeding of all excavated channel side slopes will be done for the portion completed that day. Species such as creeping red fescue, Kentucky bluegrass, redtop, timothy and birdsfoot trefoil will be used. A permanent seeding and mulching will be applied to the berm, spoil banks, borrow areas, and other areas exposed including repairing daily seedings after completion of the final shaping operation. In addition to erosive control, all seeded areas will be preserved for wildlife use.

The Rogue River Watershed Project has been coordinated with the State Historic Preservation Officer. The Michigan History Division has conducted an investigation of the area. There are eight possible archeological sites within the watershed project area. However, none are within the planned construction area.





PROJECT MAP B
ROGUE RIVER WATERSHED
KENT, MONTCALM, MUSKEGON, NEWAYGO,
AND OTTAWA COUNTIES, MICHIGAN

INSTALLATION COSTS - MONETARY

LAND TREATMENT MEASURES

The cost of technical assistance will be provided by the USDA's Soil Conservation Service and by the Michigan Department of Natural Resources cooperating with the U. S. Forest Service. These costs will help landowners plan and apply the measures recommended by each agency. The accelerated technical assistance cost is \$34,600 for the detailed soil survey of 57,600 acres. Total installation costs for the land treatment measures represents the costs of applying the planned measures to landowners plus accelerated technical assistance costs to the Federal Soil Conservation Service and Forest Service. Total land treatment costs are \$805,200. Of this cost \$194,175 are to be paid from PL-566 funds while \$611,025 are to be paid from other funds (Table 1). All land treatment costs are based on current materials costs and on labor costs in each county. The Forest Services "Other Technical Assistance Funds" (\$34,400) includes the states share of the accelerated program, the regular cooperative forestry programs, and state funding for state land.

NON-STRUCTURAL MEASURES

A flood plain management program for 21 miles of the Rogue River is the only non-structural item planned for this project. Its total installation cost is \$46,500 and includes costs for engineering and administration only. As an engineering study, it will not involve any costs for construction as structural measures do. The engineering costs of \$31,500 will be borne by PL-566 funds for field surveys, hydrologic analysis and publishing a report of findings. An additional \$15,000 has been included for developing flood plain zoning ordinances and for implementing necessary flood plain management programs. This cost is listed in appendix tables as part of the total project's administration cost to other than PL-566 funds. No land will be acquired as part of this plan feature.

Only one year will be needed to complete the surveys and the report. An additional 3 years are expected to be used in developing and implementing measures to implement those findings (Table X).

STRUCTURAL MEASURES

Total installation costs for project structural measures are \$1,979,865 (Table 1). Installation costs include costs for construction and contingencies, engineering, land rights, and administrative overhead. Of this installation cost \$1,601,500 is to be paid by PL-566 funds and \$378,365 is to be paid by other funds.

Construction cost estimate for channel work was developed by determining types and quantities of construction items and includes the following: clearing and grubbing of the channel area; necessary clearing for berms and spoil banks in the easement area; establishment of permanent vegetation of channel slopes, berms, and part of the spoil area in that part of the work requiring excavation; clearing as necessary for equipment access; close cutting of trees and brush; surface water inlet pipes and tile outlets; collection ditches; toe drains and rock rip-rap as required for the improvement; pump station on the Rogue River below 120th Street; 5 water control structures, underpinning 3 existing farm crossings, underpinning 1 existing road crossing, 1 debris basin in Reach 6, upstream on the Danials Creek Drain from station 578+00; a second debris basin in Reach 1 above 136th Street. Construction cost estimate for the streambank protection measures was derived by determining quantities of vegetative materials needed, fertilizer requirements, and machine and hand labor requirements needed for planting.

Unit costs used to calculate the total estimated construction cost reflect unit prices adjusted to 1974 levels from the most recent bid available for similar construction. The construction cost estimate includes a 20 percent contingency allowance to cover unexpected circumstances that develop during the construction process.

Land rights costs include easements and right-of-way costs plus costs for new farm crossings and new road crossings. Land easement or acquisition costs are based on average per acre costs of \$350 to \$1,000 depending on the parcel location. The plan estimates that 247 acres will be needed for structural measures. Estimates for structural measures include 12 new farm crossings at a total cost of \$51,800: 4 on Centerline Drain, 4 on West Branch Drain and 4 on the diversion portion of the Rogue River Inter-County Drain. One new public road crossing at 120th Street (\$13,000) and 1 existing public road crossing at Oak Avenue (\$21,200) are also included in land costs.

Total land costs for structural measures above is \$258,150 (Table 2). About 72 percent (\$187,050) of this accounts for land easements while 28 percent (\$71,100) is composed of farm and road crossing costs. All these land costs will be paid for by funds other than PL-566.

The cost of engineering services includes the costs for surveys, investigations, design, and preparation of plans for the structural measures. These costs were established as a percentage of the total construction costs. Estimated project engineering cost is \$137,730 a PL-566 cost.

Project administration costs are the PL-566 and other administrative costs associated with the installation of structural measures. Included are the cost of contract administration, the government representative, construction surveys and construction inspection. These costs were also established as a percentage of the total construction cost. Estimated project administration costs are \$221,685 of which \$137,790 is from PL-566 and \$83,895 is from other than PL-566 funds.

Costs for the multiple-purpose (flood prevention and drainage) channel work in all drains (including the pump) were allocated 92 percent to flood prevention and 8 percent to drainage according to the areal relationship of wetland to non-wetland. Costs for the single-purpose debris basin, streambank protection and flood hazard study accrue entirely to flood prevention purposes. The total allocations to all project measures shows 93 percent (\$1,673,090) to flood prevention and 7 percent (\$131,590) to drainage (Table 2A).

There are no relocations of homes or other structures due to this project.

The installation of the project will be accomplished in a period of 5 years. An estimated schedule of PL-566 and other obligations, separating multiple-purpose and single-purpose channel work is shown in the following table. Three years are allowed for actual construction. For estimating purposes land treatment costs are allocated over 5 years. After the initial engineering studies are completed an estimated 3 years will be needed to carry out the flood plain management and enforcement measures.

All items except land treatment have been listed in the order of construction required on the Proposed Structural Measures Section of this report. All costs listed are unamortized totals of construction, engineering, land administration to agree with Table 1, also of this report. Land treatment costs for each year were taken directly from Forest Service data, while Soil Conservation Services costs were totaled (including \$34,600 for a detailed soil survey) and then allocated equally over a 5 year period.

INSTALLATION COSTS, AS
SHARED OVER INSTALLATION PERIOD

<u>Fiscal Years, Item</u>	<u>PL-566 Funds</u>	<u>Other Funds</u>	<u>Total</u>
<u>YEAR ONE</u>			
Land Treatment	31,675	110,705	142,380
Single-Purpose Measures	144,660	29,315	173,975
Multiple-Purpose Measures	318,130	37,680	355,810
<u>YEAR TWO</u>			
Land Treatment	38,875	122,305	161,180
Single-Purpose Measures	-0-	5,000	5,000
Multiple-Purpose Measures	790,590	174,910	965,500
<u>YEAR THREE</u>			
Land Treatment	43,875	130,305	174,180
Single-Purpose Measures	-0-	5,000	5,000
Multiple-Purpose Measures	376,620	136,460	516,080
<u>YEAR FOUR</u>			
Land Treatment	40,875	125,505	166,380
Single-Purpose Measures	-0-	5,000	5,000
<u>YEAR FIVE</u>			
Land Treatment	38,875	122,205	161,080

BENEFITS - MONETARY

Structural measures will produce average annual benefits of \$640,235 of which \$529,875 are primary benefits and \$110,360 are local secondary benefits.

Flood damage reduction benefits are approximately \$82,075, more intensive land use benefits from flood prevention are \$223,900, agricultural changed land use benefits are zero, benefits from improved drainage are \$223,900 and local secondary benefits are \$110,260 (Table 6).

Secondary benefits will accrue to processors, handlers, and suppliers of goods and services. These are entirely of a local nature which will accrue around the problem areas, within the immediate zone of project influence. Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation, and were not evaluated.

COMPARISON OF BENEFITS AND COSTS

The planned structural and non-structural measures will provide estimated average annual benefits of \$640,235 (Table 6). These include primary benefits of \$529,875 and local secondary benefits of \$110,360. The estimated average annual cost is \$138,710. The ratio of benefits to costs when local secondary benefits are excluded is 3.8:1.0. The benefit-cost ratio when local secondary benefits are included is 4.6:1.0.

INSTALLATION PROVISIONS

An installation period of five years has been established for completion of the project works of improvement. The channel work program will be completed during the first three years of that period.

LAND TREATMENT MEASURES

Local landowners will install land treatment measures in cooperation with the soil conservation districts during the five-year installation period. The district will encourage landowners and operators to

maintain the land treatment measures for the protection and improvement of the watershed.

The Soil Conservation Service and the Michigan Department of Natural Resources in cooperation with the U. S. Forest Service will furnish technical assistance to the soil conservation districts to implement the ongoing and accelerated land treatment programs. Technicians will assist landowners and cooperators of the soil conservation districts in the preparation of conservation and forest management plans in the application of soil and water conservation practices.

NON-STRUCTURAL MEASURES

Algoma, Plainfield, Sparta and Tyrone Townships, the City of Rockford and Village of Sparta will develop and implement a Rogue River Flood Plain Management plan consistent with the results of the flood plain delineation. The Soil Conservation Service will provide all engineering services to develop flood plain delineation maps and high water profiles. In each case, the local sponsoring governmental units have the legal power and agree to develop and implement necessary zoning ordinances.

STRUCTURAL MEASURES

The Newaygo Soil Conservation District, East Kent Soil Conservation District, West Kent Soil Conservation District, Centerline Drain, Danials Creek Drain, Kosten Drain, Walters Drain, and West Branch Drain Drainage Districts, and the Rogue River Inter-County Drainage Board will provide funds for sharing construction costs and for the necessary land rights. The Soil Conservation Service will award and administer all contracts for the works of improvement.

The drainage boards have the power of eminent domain which will be used if necessary to obtain land easements.

There are no relocations involved in the project.

The Soil Conservation Service will furnish federal funds for sharing construction costs and will furnish the engineering for the channel work including the preparation of construction drawings and specifications, layout work, inspection of construction, and the certification of payments.

FINANCING PROJECT INSTALLATION

The local financial responsibilities will be assumed by the Kent and Newaygo Counties Drainage Boards and the Inter-County Drainage Board. Drainage Boards are legally organized under the drainage laws of the State of Michigan. Each has the authority to levy assessments for raising local funds to be used in cost-sharing for construction of structural measures, for administration of contracts, and for furnishing land rights (including the power of eminent domain).

Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation.

At this time, there is no indication of the extent to which the necessary land rights will be obtained through donations. This can only be determined at the time of negotiating with the affected property owners for the necessary land rights.

The sponsoring local organizations have analyzed their financial needs in consideration of the scheduled installation of the works of improvement and are able to make funds available when needed.

Federal funds are to be provided by the Soil Conservation Service in carrying out this project and are contingent upon appropriations available for this purpose.

The cost of applying land treatment measures on private land will be the responsibility of the individual landowners and operators. Technical assistance will be provided through the current programs of the soil conservation districts and the cooperative forestry programs

of the Michigan Department of Natural Resources and the U. S. Forest Service. Technical assistance for accelerating the installation of needed land treatment measures will be provided by PL-566 funds. Landowners may also receive cost-sharing assistance through the programs of the Agricultural Stabilization and Conservation Service.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land treatment measures will be operated and maintained by individual landowners or farm operators. This will be accomplished under cooperative agreements with the soil conservation district. Technical assistance will be provided by the Soil Conservation Service and for forestry measures, by the Michigan Department of Natural Resources, in cooperation with the U. S. Forest Service under cooperative forestry programs.

An establishment period not to exceed three years is provided for the structural work and associated vegetative cover. During this period the Soil Conservation Service may use PL-566 funds to cost share on any repairs or other work resulting from unknown site conditions or latent defects. The cost of repairs will be shared in the same ratio as the original structure. Cost of work under this provision will be limited to 10 percent of the contract cost. Type of work includes minor structural measures such as reshaping of the constructed channel and rock toes and prompt establishment of adequate vegetative cover.

The continued functioning of the multiple-purpose channel work and pumping station in providing the degree of flood protection and drainage for which they were designed and for serving as adequate outlets will require a timely maintenance program. This will require the control of undesirable vegetal growth by mowing and/or spraying; resloping of eroding banks; removing sediment bars from channels; and removing debris from pipes, trash racks, and pumps.

Annual operation and maintenance costs total an estimated \$12,390 for all project measures, \$1,600 of which concerns the nonstructural flood plain management and \$10,790 of which concerns planned structural measures. Non-structural O & M will be sponsored and paid by the appropriate township, village and city entities. Structural O & M will be sponsored and paid by the appropriate Drain Commissioners (and the Inter-County Drainage Board in the case of the Rogue River).

The following items will be provided for in the maintenance program:

1. A specific maintenance agreement between the Soil Conservation Service and the appropriate sponsoring organization will be executed prior to the issuance of an invitation to bid on construction contracts. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with PL-566 financial assistance.
2. A joint inspection will be made annually or after unusually severe floods by representatives of the sponsoring organizations including those in the Drainage District having responsibility for the works of improvement to be installed. Representatives of the Soil Conservation Service will assist with these inspections. A record will be made of all inspections, with one copy for the sponsoring organization and one copy for the Soil Conservation Service.
3. After an initial three-year period of joint inspection, the inspections of the structural works of improvement will be made annually by the sponsors, and a copy of the report prepared by them will be sent to the Soil Conservation Service representative.
4. All costs for labor, equipment and materials for operation and maintenance will be furnished by the appropriate local sponsoring organization.
5. Maintenance rights-of-way to the structural measures will be furnished by local sponsoring organization.
6. Maintenance work on seeded areas by mowing or spraying with environmentally safe chemicals should be done at a time which will allow for completion of the nesting season, preferably after July 15.
7. Sponsoring city, village and townships will monitor and enforce zoning ordinances and other flood plain management measures.

TABLES

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Rogue River Watershed, Michigan

Installation Cost Item	Unit	Federal Land 3/	Number of Units Non-Fed. Land 2/	Estimated Cost (Dollars) 1/					Total P.L. 566 & Other	
				P.L. 566 Funds		Other Funds				
				Non-Federal SCS 4/	Land FS 4/	Total	Non-Federal SCS 4/	Land FS 4/		Total
Land Treatments:										
Land Areas 2/										
Cropland	Acres	-0-	2,140							207,400
Pastureland	to be	-0-	5,150							215,600
Forest	treated	-0-	2,420							86,100
Other		-0-	818							43,500
Technical Assistance	Days		2,177							218,000
Detailed Soil Survey	Acres		57,600							34,600
TOTAL LAND TREATMENT										
Non-Structural Measures (Rogue River Flood Plain Management):										
Engineering Services	Stream miles	-0-	21							31,500
Project Admin.		xxxx	xxxx							-0-
Other	xxxx	xxxx	xxxx							15,000
TOTAL NON-STRUCTURAL MEASURES										
Structural Measures:										
Construction										
Channel Modification	Miles	-0-	11.6							40,040
(M) 5/	Number	-0-	1							11,280
Pumping Station	Number	-0-	1							-0-
Debris Basin	Number	-0-	1							-0-
Streambank Protection	Acres	-0-	21							66,300
Subtotal-Const.	xxxx	xxxx	xxxx							51,320
Engineering Services	xxxx	xxxx	xxxx							-0-
Project Admin.										137,730
Construction Insp.										-0-
Other										68,895
Subtotal-Admin.	xxxx	xxxx	xxxx							68,895
Other Costs										-0-
Land Rights	Acres	-0-	247							258,150
TOTAL STRUCTURAL MEASURES										
TOTAL PROJECT										

^{1/} Price Base, 1974.

^{2/} Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.

^{3/} Type of land involved: Non-Federal (private) or Federal (public). Note that no Federal land is involved.

^{4/} Federal agency responsible for assisting in installation of works of improvement: Soil Conservation Service or Forest Service.

^{5/} Type of channel before project: (M) - manmade ditch or previously modified channel.

December 1974.

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

Rogue River Watershed, Michigan

Measures	Unit	Applied to Date	Total Cost (Dollars) ^{1/}
Land Treatment			
District Cooperators	No.	406	--
Conservation Plans	No.	359	--
Conservation Cropping System	Acres	8,553	42,765
Critical Area Planting	Acres	60	3,000
Crop Residue Management	Acres	6,769	6,769
Drains	Feet	526,589	210,636
Drainage Main or Lateral	Feet	68,437	68,437
Field Windbreak	Feet	7,950	795
Firebreaks	Feet	1,000	1,000
Fishpond Management	No.	5	50
Fire Control	Acres	50,700	50,700
Forest Management Plans	Number/Acres	8/150	800
Grade Stabilization Structure	No.	13	1,300
Grassed Waterway or Outlet	Acres	50	5,000
Land Smoothing	Acres	253	5,060
Minimum Tillage	Acres	3,351	16,755
Pasture and Hayland Management	Acres	496	9,920
Pasture and Hayland Planting	Acres	791	47,460
Ponds	No.	49	73,500
Stripcropping	Acres	309	3,090
Timber Stand Improvement	Acres	3,900	117,000
Tree Planting	Acres	565	28,200
Wildlife Upland Habitat Management	Acres	1,216	24,320
Wildlife Wetland Habitat Management	Acres	280	28,000
Woodland Improved Harvesting	Acres	675	10,100
TOTAL			754,657

^{1/} Price Base, 1974.

December 1974.

TABLE 2 - ESTIMATED COST DISTRIBUTION

Rogue River Watershed, Michigan

(Dollars)^{1/}

Item	Installation Cost - P.L. 566 Funds			Installation Cost - Other Funds			Total Installation Cost
	Construction	Engineering	Total P.L. 566	Construction	Land Rights	Total Other	
Structural Measures:							
Multiple-Purpose (F.P. & Dr.) Measures							
Centerline Drain	95,800	9,980	105,780	3,990	37,910 ^{2/}	41,900	147,680
Danials Creek Drain	70,945 ^{3/}	7,390	78,335	2,955	21,000	23,955	102,290
Kosten Drain	120,805	12,500	133,385	5,035	35,770	40,805	174,190
Rogue R. Inter-Co. ^{4/}	853,910 ^{5/}	88,960	942,870	35,580	103,170	138,750	1,081,620
Walters Drain	56,705	5,900	62,605	2,365	22,440	24,805	87,410
West Branch Drain	33,515	3,490	37,005	1,395	13,260	14,655	51,660
Single-Purpose (F.P.) Measures							
Danials Creek Drain	28,000	2,800	30,800	-0-	3,600	3,600	34,400
Debris Basin	66,300	6,630	72,930	-0-	21,000	21,000	93,930
Streambank Protection	1,325,980	137,730	1,463,710	51,320	258,150	309,470	1,773,180
Subtotal							
Non-Structural Measures							
Single-Purpose (F.P.) Measures							
Rogue River Flood Plain Management	-0-	31,500	31,500	-0-		-0-	31,500
TOTAL	1,325,980	169,230	1,495,210	51,320	258,150	309,470	1,804,680
Project Administration	xxxx	xxxx	137,790	xxxx	xxxx	83,895 ^{6/}	221,685
GRAND TOTAL	1,325,980	169,230	1,633,000	51,320	258,150	393,365	2,026,365

December 1974.

^{1/} Price Base, 1974.^{2/} Includes \$23,000 for 4 new farm crossings.^{3/} Includes \$16,890 for 1 drop structure.^{4/} Includes all costs for the pumping station (\$282,000 total construction cost).^{5/} Includes \$15,000 for construction of a temporary, construction debris basin (13,320 cubic yards) near 136th Street and \$8,100 for 2 water level control structures on the new diversion channel.^{6/} Includes \$15,000 for preparing and implementing a flood plain management program.

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Rogue River Watershed, Michigan

(Dollars) ^{1/}

Item	Cost Allocation		Cost Sharing			
	Purpose		P.L. 566 Funds		Other Funds	
	Flood Preven- tion	Total	Flood Preven- tion	Drainage	Flood Preven- tion	Drainage
Structural Measures:						
Multiple-Purpose (F.P. & Dr.) Measures						
Centerline Drain	135,870	147,680	100,990	4,790	34,880	7,020
Danials Creek Drain	94,110	102,290	74,790	3,545	19,320	4,635
Kosten Drain ^{2/}	160,250	174,190	127,340	6,045	32,910	7,895
Rogue R. Inter-Co.	995,090	1,081,620	900,170	42,700	94,920	43,830
Walters Drain	80,410	87,410	59,770	2,835	20,640	4,165
West Branch Drain	47,530	51,660	35,330	1,675	12,200	2,455
Single-Purpose (F.P.) Measures						
Danials Creek Drain	34,400	34,400	30,800	-0-	3,600	-0-
Debris Basin	93,930	93,930	72,930	-0-	21,000	-0-
Streambank Protection	1,641,590	1,773,180	1,402,120	61,590	239,470	70,000
Subtotal						
Non-Structural Measures:						
Single-Purpose (F.P.) Measures						
Rogue River Flood	31,500	31,500	31,500	-0-	-0-	-0-
Plain Management						
GRAND TOTAL	1,673,090	1,804,680	1,433,620	61,590	239,470	309,470

^{1/} Price Base, 1974.^{2/} Includes all costs for the pumping station (\$282,000 total construction cost).

December 1974.

TABLE 3 - STRUCTURE DATA
CHANNELS

Rogue River Watershed, Newaygo County Michigan

Channel Name	Channel Reach	Sta.	Drainage Area (sq. mi.)	Capacity CFS	Water Surface Elev.	Hydraulic Gradient (ft/ft)	Width (ft)	Grade (%)	Flow Depth	Slope	Side Slopes	"n" Value As Aged	Velocities As Aged Built	Excavation 1000 Cu. Yds.	Type Of Work	Type Of Channel	Condition
Rogue River	III	502+00	0.14	31	785.4	.000200	4-10	.008	3	2 1/2:1	2 1/2:1	.04	1.3 1/2	1.4	IV	M (1915)	I
		617+00	0.98	83	783.2	.000200	4-10	.008	4.5	2 1/2:1	2 1/2:1	.035	0.62 1/2	1.3	IV	M (1915)	Pr
II		617+00	9.56	140	783.2	.000067	22	.007	5.3	2 1/2:1	2 1/2:1	.040	.022	0.8	II	M (1915)	Pr
		647+00	9.86	140	783.0	.000067	22	.007	5.4	2 1/2:1	2 1/2:1	.040	.022	0.7	II	M (1915)	Pr
I		647+00	33.87	428	784.5	.000132	30	.019	7.0	2 1/2:1	2 1/2:1	.040	.025	1.3	II	M	Pr
		742+00	35.60	434	783.4	.000132	30	0	7.4	2 1/2:1	2 1/2:1	.040	.022	1.3	II	M	Pr
Diversion	VII	491+00	14.62	102	789.2	.000115	20	.048	4.1	2 1/2:1	2 1/2:1	.040	.022	0.8	I	None	
		550+00	17.10	116	787.4	.000076	12	.048	5.0	2 1/2:1	2 1/2:1	.040	.025	0.7	III	M	I
		579+00	17.44	116	786.5	.000106	12	.048	5.7	2 1/2:1	2 1/2:1	.040	.025	0.9	I	None	
Daniels Creek Drain	VI	579+00	23.40	295	786.5	.000162	24	.048	5.7	2 1/2:1	2 1/2:1	.035	.025	1.4	III	M	Pr
		604+00	23.70	295	785.1	.000183	24	.048	4.6	2 1/2:1	2 1/2:1	.035	.025	1.4	III	M	Pr
Kosten Drain	VI	647+00	24.01	295	784.5	.000097	24	.048	7.0	2 1/2:1	2 1/2:1	.035	.025	1.2	III	M	Pr
														75.6	III		
West Branch Drain	V	490+00	0.15	32	789.4	.000990	4	.114	2.4	2 1/2:1	2 1/2:1	.045	.022	1.3	IV	M (1915)	I
														8	IV		
Walters Drain	V	524+00	1.00	66	788.0	.000820	4	.114	2.6	2 1/2:1	2 1/2:1	.045	.022	1.3	IV	M (1915)	I
		583+00	1.59	66	783.4	.000360	4	.114	5.3	2 1/2:1	2 1/2:1	.045	.022	1.1	IV	M (1915)	I
Centerline Drain	IV	516+50	4	35	783.7	.000037	4	.007	5.2	2 1/2:1	2 1/2:1	.040	.022	0.5	IV	M (1915)	I
		542+00	5.24	57	783.6	.000027	6	.007	5.2	2 1/2:1	2 1/2:1	.040	.022	0.5	IV	M (1915)	I
		583+00	8.31	104	783.4	.000062	18	.007	5.3	2 1/2:1	2 1/2:1	.040	.022	0.7	IV	M (1915)	Pr
		617+00	8.58	104	783.2	.000053	18	.007	5.3	2 1/2:1	2 1/2:1	.040	.022	0.6	IV	M (1915)	Pr

1/ Based on Present Condition stage - discharge curves.

2/ I - Establishment of new channel including necessary stabilization measures.

II - Enlargement of existing channel or stream for bank stabilization, favorable velocities or favorable upstream water surface profile.

III - Enlargement or realignment of existing channel or stream for increased capacity.

IV - Cleaning out natural or manmade channel (includes bar removal, bank stabilization and depth for drainage).

3/ M () - Manmade ditch or previously modified channel. Parenthesis show approximate date of original major construction.

4/ Pr - Perennial - flows at all times except during extreme drought.

I - Intermittent - continuous flow through some seasons of the year, but little or no flow through other seasons.

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TABLE 3A - STRUCTURAL DATA

ROCK DROP STRUCTURE

Rogue River Watershed, Michigan

Location	Drop Dimensions				Estimated
	Drop	Bottom	Side	Channel	Quantities
	(Feet)	Width	Slope	Slope	Rock Rip Rap
		(Feet)			& Filter
					(Cu. Yds.)
Kosten Drain STA. 578+00	6	6	2½:1	10:1	338

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TABLE 3B - STRUCTURAL DATA
 WATER LEVEL CONTROL STRUCTURES
 Rogue River Watershed, Michigan

Location	Structure Dimensions		Concrete (Cu. Yds.)
	Drop ^{1/} (Feet)	Width (Feet)	
Rogue River STA. 470+00 ^{2/}	3	20	12
Reach #3 STA. 585+00 ^{3/}	5.5	6	13.6
Diversion Reach #7 STA. 563+00 ^{3/}	5.5	12	12
Walters Drain Reach #5 STA. 570+00 ^{3/}	4.5	4	9
Reach #5 STA. 552+00 ^{3/}	4.5	4	9
Reach #5 STA. 528+00 ^{3/}	4.5	4	9
West Branch Drain Reach #5 STA. 504+00 ^{3/}	4.5	4	9

^{1/} Height of drop with all stoplogs in place.

^{2/} Lake level control structure

^{3/} Water level control structure established to control water table levels and maintain a reservoir for irrigation water.

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TABLE 3C - STRUCTURAL DATA

PUMPING STATION

Rogue River Watershed, Michigan

Location	Drainage Required		River Channel Bottom Elevation	Design Water Surface Elevations			
	Area (Square miles)	Discharge (CFS) (gpm)		10 yr. Above Pumps	25 yr. Above Pumps	Below Pumps	Below Pumps
Rogue River Reach #2 STA. 646+00	9.7	140 60,000	777.6	783	784.5	783.9	786.3

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TABLE 4 - ANNUAL COST
Rogue River Watershed, Michigan
(Dollars)^{1/}

Evaluation Unit	Amortized Installation Cost ^{2/}	Operation and Maintenance Cost	Total
All Structural Measures	110,535	10,790	121,325
All Non-Structural Measures: Flood Plain Management	1,965	1,600 ^{3/}	3,565
TOTAL	112,500	12,390	124,890
Project Administration	13,820	xxxx	13,820
GRAND TOTAL	126,320	12,390	138,710

^{1/} Price Base, 1974.

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^{2/} 50 years at 5 7/8 percent interest.

^{3/} Includes \$1,600 to carry out and enforce a flood plain management program.

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Rogue River Watershed, Michigan

(Dollars)^{1/}

Damage Item	Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
<u>Direct Damages:</u>			
Floodwater			
Crop and Pasture	63,620	2,535	61,085
Other Agricultural	600	30	570
Future Homes & Contents	10,500	-0- ^{2/}	10,500
Sediment Reduction			
Channel Deposition	2,860	-0- ^{3/}	2,860
Subtotal, Direct	77,580	2,535	75,015
<u>Indirect Damages:</u>			
Crop and Pasture	12,200	6,100	6,100
Future Homes & Contents	14,600	-0-	1,600
Subtotal, Indirect	13,800	6,100	7,700
TOTAL	91,380	8,665	82,715

^{1/} Current Normalized Prices, WRC 1974.

December 1974.

^{2/} Damages will accrue from floods of greater magnitude than 100-year frequency, but were not evaluated.^{3/} This includes only damages and benefits occurring from channel deposition affected by structural measures.

TABLE 6 - COMPARISON OF BENEFITS AND COSTS

Rogue River Watershed, Michigan

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS ^{1/}					Total	Average Annual Cost ^{2/}	Benefit Cost Ratio
	Flood Damage Reduction	Flood Prevention More Intensive Land Use	Changed Land Use	Drainage	Secondary			
All Structural Measures	69,975 ^{3/}	223,900	-0-	223,900	108,990	626,765	121,325	
All Non-Structural Measures: Flood Plain Management	12,100 ^{4/}	-0-	-0-	-0-	1,370	13,470	3,565	
TOTAL	82,075	223,900	-0-	223,900	110,360	640,235	124,890	5.1: 1
Project Administration	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	13,820	xxxx
GRAND TOTAL	82,075 ^{5/}	223,900	-0-	223,900	110,360	640,235	138,710	4.6: 1

^{1/} Current Normalized Prices, WRC 1974.^{2/} Includes project installation costs amortized at 5 7/8 percent interest for 50 years plus cost of operation and maintenance.^{3/} This category includes \$2,860 in annual sediment benefits due to reduced channel cleanout costs.^{4/} Annual reduction in flood damages to future homes as shown in Table 5.^{5/} In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$640 annually.

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ADDENDUM

Rogue River Watershed
Work Plan
Newaygo, Kent, Montcalm, Muskegon and Ottawa Counties
Michigan
March 1975

This addendum was prepared to meet interim requirements of level C guidelines from the Water Resources Council's "Principles for Planning Water and Related Land Resources."

It includes the following elements:

1. A statement explaining the costs, prices and interest rates used in analyzing the selected plan.
2. An abbreviated environmental quality plan.
3. A display of accounts describing the selected plan as it is proposed in the companion Work Plan and Environmental Impact Statement:

National Economic Development Display
Regional Development Display
Environmental Quality Display
Social Well-Being Display

Costs, Prices and Interest Rates used in Selected Plan Analysis
 Rogue River Watershed
 Newaygo, Kent, Montcalm, Muskegon and Ottawa Counties
 Michigan

This section of the addendum explains the costs, prices and interest rates used in analyzing the selected plan shown in the companion Work Plan, the Environmental Statement, and in the display accounts of this addendum. All project costs and prices, including those used in the benefit cost ratio, are relevant in Michigan for 1974. Wherever 1974 data was not available, most recent data was updated according to Agricultural Price Standards for Water and Related Land Resources. Components of the benefit cost ratio are described as follows:

Estimated Annual Cost of Selected Plan in 1974 dollars, annualized at 5 7/8 percent interest over 50 years.	\$138,710
Estimated Annual Benefits From Selected Plan computed directly on an annual basis, current normalized prices, Water Resources Commission, 1974.	\$640,235
Benefit Cost Ratio of Selected Plan	4.6 to 1.0
Benefit Cost Ratio of Selected Plan without inclusion of Secondary Benefits	3.8 to 1.0

Environmental Quality Plan (abbreviated)
Rogue River Watershed
Newaygo, Kent, Montcalm, Muskegon and Ottawa Counties
Michigan

OBJECTIVES OF THE ABBREVIATED E.Q. PLAN

Improvement in the quality of life can be achieved with water and land resource developments which are aimed at improving the quality of the environment. The purpose of this environmental quality (E.Q.) plan is to emphasize how these qualities could be developed in the Rogue River Watershed by existing institutions.

This plan intends to list environment-related problems, show the extent of these problems and then prepare a plan to help solve them. Note that this is an abbreviated plan; it uses only data which was gathered to satisfy previous guidelines. And like the Work Plan alternatives, it is not intended to satisfy the needs of the sponsor's original application without considering other objectives.

ENVIRONMENTAL QUALITY PROBLEMS

Several different but interrelated environmental problems occur in the Rogue River Watershed. Erosion problems occur mainly as sheet erosion, streambank erosion and wind erosion. The sediments produced from this erosion increase turbidity, decrease channel capacity, and tend to flocculate chemicals and pollutants. Fishery and wildlife habitat problems include stream sedimentation, forest overcutting, excessive stream temperatures and the destruction of wetland areas. Human habitat problems show a minimal understanding of man's risks in developing land for this use as opposed to nature's uses for that land.

Other problems such as erosion due to road shoulders, roadside ditches, exposed construction sites, plowing up and down slopes, continuous recreation, vehicle traffic and unmanaged "dumping" areas, also contribute to environmental condition of the watershed. Their individual impacts, however, are not significant enough to itemize out of overall watershed indicators.

Land Quality

Erosion and sedimentation are the most evident and widespread watershed problems. Sheet erosion action moves over 700,000 tons of watershed soil each year (an average rate of 4.5 tons/acre/year overall, 18.1 tons/acre/year from farmed lands and 1.0 tons/acre/year from non-farmed lands). This produces bedload sediments which increase progressively down the Rogue River from 8.6 tons per year at the proposed pump site, to 1,500 tons per year at the Kosten-Rogue confluence, to 42,000 tons per year just above Childsdale Dam, to near-zero just below Childsdale Dam (see project map). Since the dam acts as a sediment trap, only particles in colloidal suspension are carried from this watershed into the Grand River system.

Downstream bedload increases occur more from added water contributing area than from an increase in serious erosion problems. The Newaygo County portion of the watershed contains the most serious erosion sources, while the Kent County portion (80 percent of total watershed area) has marginal erosion problems over nearly all of its area.

Some 14,700 feet (2.9 miles) of stream banks need stabilization due to continuous cropping to the edge of the banks, improper private dredging, and erosive groundwater seeps. This occurs in two large sandy areas in Newaygo County: 21 acres in Sections 24, 19 and 30 along the Danials Creek Drain, and 47 acres in Section 35 near both banks of Newaygo's lower Rogue River. These two areas were in a critical condition at the time of the survey, and are the source of most of the sediments now being deposited (and dredged out of) downstream reaches.

The 3,600 acre Rice Lake flats windblow when exposed, losing an estimated 0.1 inch of topsoil yearly. This creates seasonal dust storms, but scouring and resulting deposition in the streams are not serious. The most significant impact of this erosion is the continuous loss of the shallow and very valuable muck layer.

Over 5,000 feet of streambank and 30 acres of Rubicon sands on slopes are being overgrazed or wrongfully opened to cattle in Newaygo's Grant Township. This condition encourages streambank erosion, prohibits revegetation, and otherwise overtaxes 5,000 feet of streams.

Soil and land use pressures increase the impact of erosion and sedimentation. Over 85 percent of the watershed's sediment has come from agricultural lands. In the problem area farmed lands are generally flat, light-soiled and valuable. Open drains are either man-made or man-altered and tend to aggrade. Their frequent cleanout by floods and dredges tend to keep their right-of-way, bank slopes, bottoms and water in a disturbed or recovering condition.

Home building along the banks of the Rogue River continues to change the natural scene to man-made scene. In some areas this is done on slopes and soils which cannot support such uses. Kent County has an estimated 200 acres of loamy or sandy slopes eroding in this condition and washing sediment into the Rogue River.

Water Quality

State monitoring agencies report that when the construction of community wastewater treatment facilities is complete the Rogue's water quality will meet federal and state standards.

Water samples taken above Rockford have base flow sediment concentrations of 20 parts per million, which is near the commonly accepted upper limit of concentrations for clear water. Recent variations during high flows and dredging have temporarily increased concentrations beyond these use-limits. But short term sediment projections threaten to exceed these limits continuously. Sediments threaten existing fish species with suffocation and destroy fish habitat.

Water temperatures are also near the upper limits accepted for existing fish species. The instantaneous lethal temperature for brown trout (Salmo Trutta, regarded as the most temperature tolerant of Michigan's major stream trout species) is 81 degrees fahrenheit. In 1971 a temperature of 79 degrees fahrenheit was recorded in the Rogue River near the State Game Area. If present conditions continue it is apparent that the Rogue's cold-water classification is in danger.

Aggradation of the Rogue River channel through the problem area and downstream into the State Game Area results in a buildup of sediment containing materials which could become toxic if allowed to increase to high concentrations. Runoff carries sediment with associated adsorbed phosphates into the channels where they settle and reduce channel capacities. Nitrates are easily leached and enter the channels from subsurface flows and drain tiles. These are taken up by aquatic plants and converted, along with the phosphates from the bottom

sediments, into organic matter. The large quantities of aquatic plants in these channels indicate an abundance of both N and P since these elements are required for plant growth and are the two limiting elements to plant growth in pristine waters.

Large numbers of aquatic plants result in drastic decreases in dissolved oxygen during warm summer nights. This is a result of a cessation of photosynthetic processes after dark, combined with the low oxygen saturation levels of warm water. With the cessation of photosynthesis (oxygen production by green plants), the dissolved oxygen in the water is used by the plants in respiration. This results in an oxygen sag during the night hours, and under certain conditions may cause oxygen depletion.

The second-quality warmwater classification applied to these channels is partially based on this water quality problem.

Air Quality

State monitoring agencies report that air quality in the watershed's urban areas is now within both federal and state limits. Nevertheless, the dust and sand which blow from wind-eroding areas adversely affects local air quality.

Fish and Wildlife Habitat Quality

Most wildlife habitat problems in the watershed involve wetland drainage and woodland clearing and mismanagement. The acreage of wetlands drained each year is small, but significant considering the small amount of this habitat type remaining. Historically this watershed contained a large wetland habitat base which has been reduced through drainage to a remnant. Of the 6,089 acres of surface water remaining in the watershed less than 430 acres are of value to wildlife and less than 70 contribute significantly to waterfowl production. This process is continuing today to eliminate the few remaining wetlands, although the wetlands being drained are of primary value to upland game rather than waterfowl.

U. S. Forest Service personnel indicate that woodland habitat, although still quite abundant in terms of acreage, suffers from over-cutting and other forms of mismanagement. A small amount of woodland clearing each year continues to take a toll of valuable wildlife habitat in the watershed.

Fishery habitat problems in the watershed center around the Rogue River and its tributaries. These problems cannot be ascribed to any one single event, but are a result of several events that by themselves are relatively innocuous. The drainage of Rice Lake in the early 1900's and the subsequent channel work on the upper Rogue River in Newaygo County resulted in increased turbidity and sedimentation and a likely increase in water temperature in the lower Rogue River. Woodland clearing along various tributaries, particularly Ball, Post and Cedar Creeks, has also contributed substantially to these problems. These processes have continued to the point where the ecological community in the Rogue River is in danger of a drastic conversion from a cold-water to a warm-water community.

Aesthetic Quality Land Use and Management

Present condition of some areas in and near the Rogue's water-course threatens its beauty and safety. Nearby urban centers increasingly demand land for homesites, transportation networks, land filling or other developments and are encroaching upon sensitive areas. Prime agricultural land is being lost to other interests. Valuable wetlands are being destroyed by drainage and developments. Competition among all these land uses is expected to increase.

COMPONENT NEEDS

1. Reduce wind and water erosion by improving ground cover, stabilizing channel banks and prohibiting destructive use of sensitive areas.
2. Reduce sediment loads by reducing sediment sources and minimizing stream disturbance.
3. Improve water quality by reducing erosion, reducing runoff nutrients, keeping water temperatures within acceptable use-limits and stabilizing channel bottoms.
4. Improve air quality by reducing wind erosion.
5. Improve the quality of wildlife habitat by reducing erosion and sedimentation and providing more timber and wetland habitat for wildlife use.
6. Protect the aesthetic quality of the Rogue River Flood Plain.

ELEMENTS OF THE E.Q. PLAN

The environmental quality plan includes all of the following elements:

1. Provide resource conservation plans for the entire watershed. Conservation plans will encourage a continuing, thorough land treatment program on approximately 113,000 watershed acres. Estimated federal cost for technical assistance is \$1,185,500.
2. Provide needed land treatment on 105,000 acres of agricultural lands and 40,000 acres of forest lands which are now subject to erosion and mismanagement. Installation costs are estimated at \$2,811,000. This will accelerate application of such practices as strip cropping, contour plowing, field windbreaks, critical area treatment, crop residue management, grassed waterways, minimum tillage, pasture and hayland management, wildlife upland habitat management and tree planting and forest management.
3. Purchase 48 acres of critical sandblow areas near Newaygo County's lower portion of the Rogue River. Stabilization requires 25 acres of sprig (dune) grass and red pine plantings plus 0.5 miles of fencing. Estimated total installation cost is \$42,000.
4. Stabilize 9,100 feet of critical channel banks along the Kosten Drain above Peach Avenue with shaping, seeding, tile interceptors and surface water inlets. Estimated installation cost is \$55,000.
5. Stabilize 5,600 feet of seeping and slumping channel banks along Newaygo's lower portion of the Rogue. About 5,600 feet of continuous graveled toe drains are required at a cost of \$52,000.
6. Construct a 1,750 cubic yard sediment basin on the Kosten Drain just downstream from Peach Avenue. This basin will settle out bedload and suspended particles from the Kosten and its tributaries. It will also trap particles released during the Kosten bank sloping operations. Installation cost is \$30,000. Only four cleanouts are expected over a 50 year use-life. 1974 cost for each cleanout is \$5,000.
7. Provide shade on 106,000 feet of streambanks to lower water temperatures. Two spaced rows of staggered tree plantings will be re-

quired on 60 acres of new right-of-way. Estimated installation cost is \$53,400.

8. Purchase 430 acres of designated wetlands for preservation in wildlife use. An additional 570 acres of surrounding uplands will also be acquired for buffer zones. Total cost is \$200,000.
9. Reflood Rice Lake to provide waterfowl and furbearer habitat. This flooding would also decrease nutrient concentrations in the Rogue. Cost for 3,660 acres of land and one small water control dam are estimated near \$3,400,000. Relocation of some 40 family farm operations, including 30 farmsteads, will be necessary at considerable disruption of landowners and added expense to the project.
10. Complete a detailed soil survey for about 57,600 acres in Kent County. Cost is \$34,600.
11. Prepare and implement a comprehensive land and water use plan including environmental values in Kent and Newaygo Counties. Also include a flood hazard study and implement flood plain management regulations for all flood plain lands in the Rogue River valley. Estimated initial cost is \$46,000.

Without relocations, the total installation cost of the E.Q. plan is \$7,909,000. Construction would take less than 2 work seasons, while land treatment measures would be applied gradually. Tree plantings are expected to take five years to become effective erosion inhibitors, but grasses usually need only one year. The Rice Lake Flooding is expected to establish itself within 1 1/2 years.

INSTITUTIONAL IMPLEMENTATION

Existing institutions now have the legal ability to implement all elements of the E.Q. plan. These include a) township, city and county government, b) the joint powers of county government with drainage districts, with road commissions and with soil and water conservation districts, and c) the Rogue River Inter-County Drainage Board. All have on-going duties related to measures proposed in this plan and all have power to levy taxes and to acquire land under eminent domain.

Singly or together these groups may require assistance in implementing E.Q. measures. Other agencies have programs intended to offer financing, land acquisition, cost-sharing, planning or other assistance to qualified sponsors as follows:

Private Programs

1. Michigan Chapter of The Nature Conservancy may acquire and manage lands of high ecological value.

State Programs

1. Michigan Water Resources Commission..
 - a. Sediment and Erosion Control Program offers technical assistance and cost-sharing on certain conservation measures in cooperation with Soil Conservation Districts, USDA and State Departments of Natural Resources and Agriculture.
2. Michigan Department of Natural Resources.
 - a. Wetlands Acquisition Program buys and maintains wetland areas.
 - b. Forest management of State-owned lands.
 - c. Private Wildlife Habitat Improvement Program offers technical assistance and stock or seed packets at cost to create or upgrade private lands for wildlife.
 - d. Wilderness and Natural Areas Program acquires and manages certain areas to protect their unique environmental qualities (e.g., Natural River designations).

Federal Programs

1. U. S. Department of Agriculture
 - a. Conservation Operation Programs offer many types of assistance in soil and water conservation and sound land

use. Examples of programs include technical assistance, management consultation, counseling, special equipment loans and soils investigations. Programs are available on request to Soil Conservation Districts as well as other groups for all phases--planning, disseminating and applying--of most programs.

- b. Rural Environmental Conservation Program offers cost-sharing to individual landowners who apply conservation practices.
- c. Forest Pest Control Act of 1947 provides aid and cost-sharing for developing and conducting cooperative control programs to suppress forest insect and disease outbreaks. Assistance available to both public and private lands.
- d. Clarke-McNary Act of 1924, Section 2, provides fire protection by the state forestry agency and its cooperators, public and private.
- e. Cooperative Forest Management Act of 1950 as amended offers technical assistance to forest-land owners, loggers, processors, and consumers by the state forestry agency.
- f. Agricultural Act of 1956, Title IV provides reforestation cost-sharing on non-federal public lands, sometimes contractual services on private land and technical assistance at no cost to private landowners.
- g. Clarke-McNary Act of 1924, Section 4 permits state forestry agencies to provide tree planting stock at moderate prices. Stock is available to private landowners for certain types of non-landscape use.
- h. Agriculture and Consumer Protection Act of 1973 provides cost-sharing for tree planting and timber stand improvement and free technical assistance to landowners.
- i. Loans and Advances Program provides low interest loans and advances to organizations sponsoring projects which receive public funds.

2. U. S. Department of the Interior

- a. LAWCON (Land and Water Conservation) funds offer land financing and planning assistance for developing fish and wildlife habitat areas in recreation projects. Administered by the State.
- b. Pittman-Robertson Funds provide for wildlife research, land acquisition, and financial and technical assistance in developing wildlife habitat areas. Administered by the State.
- c. Dingel-Johnson Funds provide for fisheries research and financial and technical assistance in developing fish and habitat areas. Administered by the State.

3. U. S. Department of Housing and Urban Development

- a. Historic Preservation Grants provide for acquisition and restoration of sites and structures of historic or architectural significance.
- b. National Flood Insurance Funds provide insurance coverage to homeowners, business and industry for flood damage in qualified areas.

Educational and on-site assistance is available without additional financial aid or material from:

- 1. Local Soil Conservation Districts.
- 2. Michigan State University Extension Service.
- 3. Michigan Department of Natural Resources (for a Cooperative Hunting Program, municipal zoning, subdivision control, plat approval, junk collection, planning services, forming irrigation districts, community planning workshops and federal programs workshops).
- 4. Michigan Department of Agriculture (for sediment and erosion control and conservation planning with the DNR and the USDA).
- 5. USDA including the Soil Conservation Service and the Forest Service.
- 6. USDI including the U. S. Fish and Wildlife Service, the Bureau of Outdoor Recreation and the National Park Service.
- 7. U. S. Department of Housing and Urban Development.

To make best use of this assistance Kent and Newaygo Counties need to adopt a land use policy and implement that policy. Such a policy is in fact a qualifying requirement for Flood Insurance Assistance.

In spite of the many available programs for assistance, higher priorities for funds exist in other areas of the state and nation. Therefore additional sources of funds are needed by the local government to implement this E.Q. plan.

IMPACTS OF THE E.Q. PLAN

Implementation of the E.Q. plan in the Rogue River Watershed will provide environmental benefits for present enjoyment as well as enjoyment for future generations.

Applications of land conserving practices will be the most lasting environmental features of the E.Q. plan. They will be the base on which the success of further enhancing features will depend. Once installed, land treatment practices will reduce average annual sheet erosion rates from 6.2 tons/acre/year to 1.3 tons/acre/year over the watershed's cropland area, and from 4.5 tons/acre/year to 1.1 tons/acre/year over the watershed's total area. Sediment buildup at the Childsdales Dam will be reduced 75 percent from 42,000 tons per year to 10,280 tons per year. Runoff will be reduced 5-6 percent. And finally, wind erosion will be virtually eliminated.

Project Measures will simultaneously increase the area's usefulness to fish, wildlife and humans. Land treatments will help protect some 145,000 acres of land from further environmental damage. Stabilization measures will reclaim 71 acres of marginal land and 15,700 feet of channel banks that have been harmed or destroyed. Four miles of the Rogue River and 1.3 miles of Kosten Drain will benefit from reduced sediment loads and cleanout frequency due to the sediment basin. Existing fisheries will be protected by reducing oxygen-demanding bottom sludge and providing shade. Wetlands purchase and flooding will increase the watershed's current surface water acreage by 256 percent. Uplands habitat will be protected by purchase of 570 acres of buffer zones adjoining wetlands. The flood plain surveys and the local decision-making which they require will assure residents that any further decisions will be made with informed technical and social inputs.

The present land use pattern is expected to change significantly due to project. Given current population and urban growth these changes will not conflict with expected land needs (except for relocations due to the flooding of Rice Lake). These changes will shift lands to fisheries and wildlife use as shown in table at the end of this section. The large number of acres converted and their continued management for wildlife will increase species populations and varieties.

Most of the changes proposed in this plan can be classified as reversible and retrievable commitments of resources, but in time the needs of this area will change. For acting on those needs adoption of county-wide land use policy is potentially the most important feature of the E.Q. plan. Once basic information is available other environmentally sensitive areas can be identified, local values and priorities can be developed, and conflicts can be properly resolved.

Item	Cropland	Forest	Urban	Other	Submerged Lands	Total
Present Land Use	63,100	46,065	14,210	24,876	6,089	155,570
Land Use Conversion ^{1/}	-4,284	--	--	+618	+3,660	--
Land Use With E.Q. Plan	58,816	46,065	14,210	25,494	9,749	155,570

^{1/} Land converted to fish and wildlife uses.

Display of Accounts for the Selected Plan
Rogue River Watershed
Newaygo, Kent, Montcalm, Muskegon and Ottawa Counties
Michigan

This section of the addendum describes the plan selected and proposed to sponsors in the accompanying Work Plan and Environmental Impact Statement. Each display describes project impacts in terms of one of the following four accounts:

1. National Economic Development Account
2. Regional Development Account
3. Environmental Quality Account
4. Social Well-Being Account

Selected Plan

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Rogue River Watershed, Michigan

<u>Components</u>		Measures of Effects (average annual)	<u>Components</u>	Measures of Effects (average annual)
Beneficial effects:			Adverse effects:	
A. The value to users of increased output of goods and services.			A. The value of resources required for the plan.	
1. Flood prevention		\$305,975	1. Multiple-purpose channel work	\$ 83,205 1/
2. Drainage		223,900	2. Multiple-purpose pumping station	19,340 1/
			3. Single-purpose channel work	8,000 1/
			4. Single-purpose flood plain management program	1,955 1/
			5. Project administration	13,820 1/
			6. Operation, maintenance, repair and enforcement	12,390
Total Beneficial Effects		\$529,875	Total Adverse Effects	\$138,710
			Net Beneficial Effects	\$391,165

1_/ These costs annualized at 5 7/8 percent, over 50 years.

December, 1974

Selected Plan

REGIONAL DEVELOPMENT ACCOUNT

Rogue River Watershed, Michigan

<u>Components</u>	<u>Measures of Effects</u> (average annual)		<u>Components</u>		<u>Measures of Effects</u> (average annual)	
	<u>State of</u> <u>Michigan</u>	<u>Rest of</u> <u>Nation</u>	<u>State of</u> <u>Michigan</u>	<u>Rest of</u> <u>Nation</u>	<u>State of</u> <u>Michigan</u>	<u>Rest of</u> <u>Nation</u>
A. Income:						
Beneficial effects:						
1. The value of increased output of goods and services to users residing in the region.			1. Value of resources contributed from within the region to achieve the outputs shown.			
a. Flood prevention	\$305,975	--	a. Multiple-purpose channels	\$ 17,475 ^{1/}	\$ 65,730 ^{1/}	
b. Drainage	223,900	--	b. Multiple-purpose pumps	1,740 ^{1/}	17,600 ^{1/}	
c. Secondary	110,360	--	c. Single-purpose channel work	1,520 ^{1/}	6,480 ^{1/}	
			d. Single-purpose flood plain management program	1,960 ^{1/}	-0- ^{1/}	
			e. Project administration	5,245 ^{1/}	8,585 ^{1/}	
			f. Operation maintenance, repair and enforcement	12,390	-0-	
Total Beneficial Effects	\$640,235	--	Total Adverse Effects	\$ 40,330	\$-98,395	
			Net Beneficial Effects	\$599,905	\$-98,395	

^{1/} These costs annualized at 5 7/8 percent over 50 years.

December, 1974

Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT

Rogue River Watershed, Michigan

Components

Beneficial and adverse effects:

A. Areas of natural beauty

Measures of Effects

1. Project output will make available regional funds and resources that can be used to enhance the physical appearance of about 40 farms on 3,660 acres.
2. Change 129 acres of channel banks and sandblow areas to establish vegetation within 2 to 10 years.
3. Lower densities of aquatic flora and fauna for 2 seasons following construction in 10.5 miles of existing streams and channel.
4. Enforced management for future use of the Rogue River flood plain.
 1. Reduce average gross sheet erosion rates over the watershed by 45 percent from 4.5 to 2.5 tons/acre/year.
 2. Reduce average sheet erosion rates on cropland by 53 percent from 6.2 to 3.0 tons/acre/year.
 3. Reduce sediment accumulation to the mouth of the watershed by 47 percent from 42,000 to 22,000 tons/year.
 4. Reduce wind erosion in the sand-blow areas to near-zero rates.
 5. Reduce surface water runoff by about one percent.
 6. Protect water temperatures for designated fisheries use on the Rogue River in Kent County.
 7. Reduce average annual agricultural flooding by 92 percent from 600 to 30 acres.
 8. Increase agricultural efficiency on 3,286 acres of mucks. All of these acres are now in crop production.
 9. Provide management for 2,420 acres of forest land.
 10. Sediment and erosion will occur along 11.6 miles of channel during construction until stabilized.

Components

Measures of Effects

Beneficial and adverse effects:

(continued)

- | | |
|---|--|
| C. Biological resources and selected ecosystems | 11. Decrease channel maintenance costs and habitat disturbance. |
| | 12. Noise pollution from construction will exist for nine months during construction. |
| | 1. Reduce flood damage to wildlife and sediment damage to fisheries. |
| | 2. Lose wildlife cover along 10.5 miles of channel for up to three years. |
| | 3. Change 94 acres now in cropland to grassland and shrubs. |
| | 4. Increase wildlife habitat value of channel rights-of-way by a value equivalent to 62 acres. |
| | 5. Provide wildlife food and cover from crop residues left on fields as part of land treatment measures. |
| D. Irreversible or irretrievable commitments | 1. Loss of fossil fuels used in construction work. |

December, 1974

Selected Plan

SOCIAL WELL-BEING ACCOUNT

Rogue River Watershed, Michigan

ComponentsMeasures of Effects

Beneficial and adverse effects:

- | | |
|-------------------------------|---|
| A. Real income distribution | 1. Information for developing this display is not readily available. But preliminary estimates suggest that those with incomes from \$3,000 - \$10,000 will accrue a majority of project benefits. Those with incomes above \$10,000 will accrue the next - to - largest amount, and incomes below \$3,000 will receive the smallest amount. |
| B. Life, health, and safety | 2. Local costs to be borne by the region (\$40,330) will be distributed in about the same proportion as income accrued.

1. Planned measures are not expected to have any measurable effect on safety and protection of life or health.

2. Provide the public with basic technical knowledge of flood hazards.

3. Provide technical services to decision-makers and property owners for proper flood plain use. |
| C. Recreational opportunities | 1. Hunting and fishing opportunities will be enhanced by increasing or enhancing habitat with private land treatment measures, improved water quality and preserved wetlands. |

December, 1974

Additional References used in Abbreviated E.Q. Plan

- 1) Michigan Department of Natural Resources, TWENTY-SIXTH BIENNIAL REPORT 1971-1972, Office of the Director, Lansing, Michigan, 284 pp.
- 2) Michigan Department of Natural Resources, INFORMATION DIRECTORY, September 1973, Office of the Director, Lansing, Michigan, 32 pp.
- 3) Michigan Department of Agriculture, YOUR GUIDE TO THE MICHIGAN DEPARTMENT OF AGRICULTURE, Office of the Director, Lansing, Michigan, 32 pp.
- 4) U. S. Office of Economic Opportunity, CATALOG OF FEDERAL DOMESTIC ASSISTANCE, January 1969, Executive Office of the President, Washington, D. C., 610 pp.

USDA-SCS-EIS-WS-(ADM)-75-2- (F)MICHIGAN

ROGUE RIVER WATERSHED

Newaygo, Kent, Montcalm, Muskegon,
and Ottawa Counties, Michigan

FINAL

ENVIRONMENTAL IMPACT STATEMENT

Arthur H. Cratty, State Conservationist
Soil Conservation Service

SPONSORING LOCAL ORGANIZATIONS

Newaygo Soil Conservation District
940 West Rex St., Fremont, Mich. 49408

East Kent Soil Conservation District
West Kent Soil Conservation District
3321 Plainfield NE
Grand Rapids, Mich. 49505

Center Line Drain, Danials Creek Drain,
Kosten Drain, Walters Drain, and
West Branch Drain Drainage Districts
Courthouse, White Cloud, Mich. 49349

Rogue River Inter-County Drainage Board
Michigan Department of Agriculture
Inter-County Drains
Lewis Cass Bldg., 5th Floor
Lansing, Mich. 48913

Algoma Township
11731 Pine Island Drive
Sparta, Mich. 49345

Plainfield Township
6156 Belmont NE
Belmont, Mich. 49306

Sparta Township
156 East Division
Sparta, Mich. 49345

Tyrone Township
Kent City, Mich. 49330

City of Rockford
8 East Bridge
Rockford, Mich. 49341

Village of Sparta
156 East Division
Sparta, Mich. 49345

JULY 1975

Prepared By

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Room 101, 1405 South Harrison Rd.
East Lansing, Mich. 48823
WITH COOPERATION FROM
MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WATERSHED PLANNING SECTION

USDA ENVIRONMENTAL IMPACT STATEMENT

ROGUE RIVER WATERSHED PROJECT

Newaygo County
Kent County
Montcalm County
Muskegon County
Ottawa County

Michigan

Prepared in Accordance with
Sec. 102 (2) (C) of P1 91-190

SUMMARY

- I. FINAL
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Project Purpose and Action:

Project purposes are improved drainage, and flood damage reduction on 3,660 acres in Newaygo County, and reduction of soil erosion throughout the entire Rogue River Watershed in Newaygo, Kent, Montcalm, Muskegon and Ottawa Counties, Michigan. Proposed project actions consist of conservation land treatment measures on 10,528 acres, soil surveys on 57,600 acres, 21 stream miles of flood plain delineations for single-purpose flood prevention, 11.6 miles of multiple-purpose flood prevention and drainage channel work (10.5 miles of which is previously modified channel and 1.1 miles of which no channel exists), one multiple-purpose flood prevention and drainage pumping station and 1.7 miles of single-purpose flood prevention stream bank protection. All of the 10.5 miles of existing channels have been previously modified. 1.8 miles have perennial flow through idle or pasture land with grasses, brush and a few trees on the banks. 3.7 miles have perennial flow through cropland with grasses on the banks. 1.3 miles have perennial flow through mixed idle and cropland with grasses and brush on the banks. 3.6 miles have intermittent flow through cropland with grasses on the channel slopes. 1.1 miles of new channel will pass through equal portions of cropland and idle land.

V. Summary of Environmental Impact including Favorable and Adverse Environmental Effects:

Increased agricultural efficiency on 3,324 acres of muck which are already intensively managed.

Reduce wind erosion in the sandblow areas to near-zero rate.

Reduce surface water runoff by about 1 percent.

Reduction of gross erosion rates by 45% from 4.5 to 2.5 tons per acre per year.

Enforced management for future use of the Rogue River flood plain to maintain the natural features of the area.

Reduced average annual flood damage received by 40 landowners on 3,660 acres and by the related area economy. The reduction is from \$79,280 to \$9,305 or 88%.

Decreased channel maintenance needs which result in less habitat disturbance and annual savings of \$2,860 to landowners.

Improved water quality in the Rogue River trout fishery as a result of sediment reductions and temperature protection.

Improved employment stability for approximately 300 families of local residents and migrants. Income of farm operators will be increased by \$519,375.

Increased prime woodland wildlife habitat by 4.4 acres.

Increased prime grassland wildlife habitat by 69.2 acres.

Net removal of 94 acres of agricultural land from crop production.

Temporary (construction period plus 9 months) disturbance of 182 acres of wildlife habitat in the construction area.

Bottom fauna and flora in 10.5 miles of channel will be disturbed during construction. It will require two seasons for restoration of the present aquatic community.

Shift of 94 acres now in crop production to grassland with shrubs.

Noise pollution from construction will exist for about nine months during construction.

Project output will make available regional funds and resources that can be used to enhance the physical appearance of about 40 farms on 3,660 acres.

Change 129 acres of channel banks and sandblow areas to established vegetation within 2 to 10 years.

Reduce average sheet erosion rates on cropland by 53 percent from 6.2 to 3.0 tons/acre/year.

Reduce sediment accumulation to the mouth of the watershed by 47 percent from 42,000 to 22,000 tons/year.

Protect water temperatures for designated fisheries use on the Rogue River in Kent County.

Reduce average annual agricultural flooding by 92 percent from 600 to 30 acres.

Provide management for 2,420 acres of forest land.

Sediment and erosion will occur along 11.6 miles of channel during construction until stabilized.

Provide wildlife food and cover from crop residues left on fields as part of land treatment measures.

Loss of fossil fuels used in construction work.

VI. Alternatives:

1. Accelerated land treatment.
2. Raise Ransom Lake for flood water storage.
3. Dike and pump problem area.
4. Channel work only.
5. Purchase problem area and reflood for fish, wildlife and recreation uses.
6. No project action.

VII. Agencies From Which Comments Have Been Received

Department of the Army
Department of Health, Education and Welfare
Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
Michigan Department of Agriculture
Michigan Department of Natural Resources

VIII. The draft environmental impact statement transmitted to CEQ on March 26, 1975.

USDA SOIL CONSERVATION SERVICE FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR

ROGUE RIVER WATERSHED, MICHIGAN

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Newaygo Soil Conservation District
East Kent Soil Conservation District
West Kent Soil Conservation District
Centerline Drain Drainage District
Danials Creek Drain Drainage District
Kosten Drain Drainage District
West Branch Drain Drainage District
Rogue River Inter-County Drainage Board
Walters Drain Drainage District
Algoma Township
Plainfield Township
Sparta Township
Tyrone Township
City of Rockford
Village of Sparta

PROJECT PURPOSES AND GOALS

The primary purposes of the local sponsoring organizations are watershed protection through conservation land treatment, streambank protection, flood plain delineation, and soil surveys; flood prevention; improved agricultural drainage on existing cropland; and fish and wildlife protection.

The watershed application which was submitted by the sponsors on June 5, 1967 indicated the following specific goals and purposes for the Rogue River Watershed:

1. Application of conservation practices such as water impoundments, grade control structures, grassed waterways, strip cropping, terraces, windbreaks and open ditch and tile drainage for the purposes of improved drainage and reduction of wind and water erosion, surface runoff and sedimentation.
2. Channel work on the Rogue River and its tributaries to improve drainage and reduce floodwater damages.
3. A structure across the Centerline Drain in the Rice Lake muck area to control water levels.
4. Removal of fallen trees from main channels to improve flow.
5. Cleanout of the City of Rockford's water supply reservoir.

Sponsors expect land treatments to reduce runoff, erosion and sediment; improve production efficiency on all categories of land (including cropland; pastures, forests and other lands); and improve fish and wildlife habitat for recreation and aesthetic enjoyment. The objectives the land treatment program will then include protecting, maintaining and improving those items by applying adequate levels of treatment. After a preliminary investigation the following more specific goals were developed: reduce overall surface runoff; reduce gross watershed sheet erosion to an allowable rate; reduce sheet erosion on cropland to an allowable rate, and finally increase agricultural efficiency on watershed croplands.

Flood plain protection and delineation goals for 21 miles of the Rogue River will protect and limit future development in the area and will complement efforts being made to designate parts of this river under the Country Scenic River proposal. Soil surveys on 57,600 acres will be used to fulfill goals of identifying prime agriculture cropland and prime wetland areas.

Sponsors' goals are to reduce flooding and improve drainage in the Newaygo County portion of the Rogue River and its tributaries (the Centerline, Walters, West Branch, Kosten and Danials Creek Drains). This area contains 3,660 acres of muck commonly known as the old Rice Lake Basin. About 3,380 acres of this is now in cropland. Channels in the area now begin flooding between the one and two-year frequency events.

Adequately reduced flooding will increase the quality and quantity of the specialty crops grown, and increase the efficient agricultural use of the valuable muck soils. The crops and soils in this area require flood and drainage control, water table control and erosion protection. Neither can tolerate dryness or moisture for extended periods without some loss.

Sponsor goals and purposes, discussed above can all be met except numbers 4 and 5. In regards to the removal of fallen trees from the channels to speed up flow (No. 4), it was found that this situation did not affect the problem area and no action was justified. Solutions to item No. 5, on the cleanout of the City of Rockford's reservoir, are not eligible for assistance under PL-566.

PLANNED PROJECT *

Rogue River Watershed, 155,760 acres is located in west-central lower Michigan. Land use includes 30 percent cropland, 30 percent pasture and wildlife, 30 percent forest land and 10 percent other. Principal problems include flooding; impaired drainage; erosion and resulting sedimentation; and improper land use. The planned project includes conservation land treatment, non-structural measures and structural measures.

LAND TREATMENT MEASURES

The land treatment measures planned to be installed during the project period includes practices that will adequately treat 2,140 acres of cropland, 2,420 acres of forest land, 5,150 acres of pasture and 818 acres of other land. Land adequately treated is used within its capability on which the conservation practices that are essential to its protection and planned improvement have been applied. There will be partial treatment on the remaining acres in the watershed. The acres planned to be treated are realistic goals based on past accomplishments, available technical assistance and cost sharing. Experience from other watersheds in Michigan shows that about 85% of the planned land treatment measures have been applied. Additional measures will also be applied to the land after the installation period as a part of the Soil Conservation Districts ongoing conservation program.

During the five-year project period, 45 new conservation plans will be prepared. A conservation plan is the properly recorded decisions of the cooperating landowner or operator on how he plans within practical limits, to use his land in an operating unit within its capability and to treat it according to its needs for maintenance or improvement of the soil, water, and plant resources. Assistance will also be provided through the preparation of forest land management plans for 120 landowners.

*All information and data, except as noted, were collected during watershed planning investigations by the Watershed Planning Section of Michigan's Department of Natural Resources, and the U.S. Forest Service.

Practices to be applied on cropland include field windbreaks, conservation cropping systems, crop residue use, critical area planting, grade stabilization structures, grassed waterways, minimum tillage, drainage mains and laterals, drainage field ditches, tile drains, and wildlife upland habitat management. Treatment to be applied on pasture land include grade stabilization structures, grassed waterways, drainage mains and laterals, pasture and hay land management, pasture and hay land planting, drainage and field ditches, tile drains, and wildlife upland habitat management.

Land treatments for forest land include tree planting, 620 acres; harvest cutting, 1,550 acres; timber stand improvement, 1,700 acres; wildlife habitat improvement, 250 acres; urban environmental forestry, 45 man days; insect and disease assistance, 30 man days; and a continuing fire control program to maintain desirable watershed protection. Measures to be applied on other land include grassed waterways, ponds, and wildlife upland habitat management. Definitions of land treatment practices are given in Appendix D.

Installed land treatment measures will be maintained by the landowners, operators, and responsible land managers. Technical assistance will be made available to private landowners through the going programs of the Newaygo, East and West Kent Soil Conservation Districts in cooperation with the Soil Conservation Service; and the Michigan Department of Natural Resources in cooperation with the U. S. Forest Service under cooperative forestry programs.

Forty-seven acres of critical sandblow areas in Section 35, T 11 N, R 12 W, will be treated.

NONSTRUCTURAL MEASURES

The Soil Conservation Service will provide technical assistance for the flood plain delineation for Rogue River Flood Plain Management. This will be accomplished on approximately 21 miles of the Rogue River from its confluence with the Grand River in Section 23 Plainfield Township, to Section 23 of Tyrone Township, Kent County.

Planned flood plain study will be conducted in detail according to standard hydrology principles agreed to by the Soil Conservation Service and the Michigan Department of Natural Resources. Under established procedures, detailed field surveys of the channels, bridges, flood plain and other structures are made to enable computation of hydraulic characteristics of the stream. Soils, land use and rainfall-runoff determinations are used to predict flood peaks and elevations.

The flood plain delineation report will consist of high water profiles, delineated flood plain, discharges and narrative to be used as a basis for flood plain regulations. This information will be used by the communities along the river as a basis for implementing statutes concerning flood plain land use and development and to provide data for the administration of natural rivers zoning.

Michigan's Natural Rivers Act (Act 231, P.A. 1970) authorizes the Michigan Natural Resources Commission to establish a system of Natural Rivers in the state and to provide for their preservation, protection and enhancement. The Rogue River in Kent County has been formally designated as a "Country-scenic" river under this Act and, as such, a Natural River District was established. This District is a strip of land 300 feet wide on each side of and parallel to the Rogue River and its designated tributaries. (Spring, Cedar, Duke, Stegman, Rum, Shaw and Barkley Creeks from their headwaters to their confluences with the Rogue are the designated tributaries. Within this area, future development and use will be controlled so as not to be injurious to the existing private development, to maintain the river for its natural values, and to limit development where risk of flooding exists.

A detailed soil survey will be made on 57,600 acres of the Kent County portion of the watershed. This survey will be done mainly in areas of prime agricultural land and wetlands that might undergo a change in land use. Detailed soil surveys have been made on most of the benefited land in Newaygo County. The soil surveys will be used as a basis for zoning, development and management of the prime agricultural land and wetlands of the watershed.

STRUCTURAL MEASURES

In order to meet project objectives of improving drainage and reducing floodwater damages, the present drainage system will be altered. The project area was divided into seven reaches for economic and hydrologic studies (Appendix B). The Rogue River through Reaches II and III (refer to project map in Appendix B) will no longer carry flood flows from Ransom Lake. These flows will be diverted along the east side of the problem area through Reach VII, into the Danials Creek Drain, thence into Kosten* Drain and then join the Rogue River at station 647+00. A pumping station will be constructed just north of the confluence of the Rogue River and Kosten Drain in Reach II (Figure 2) and will pump local inflow from Reaches II, III, IV, and V.

*Also known as Costen Drain.

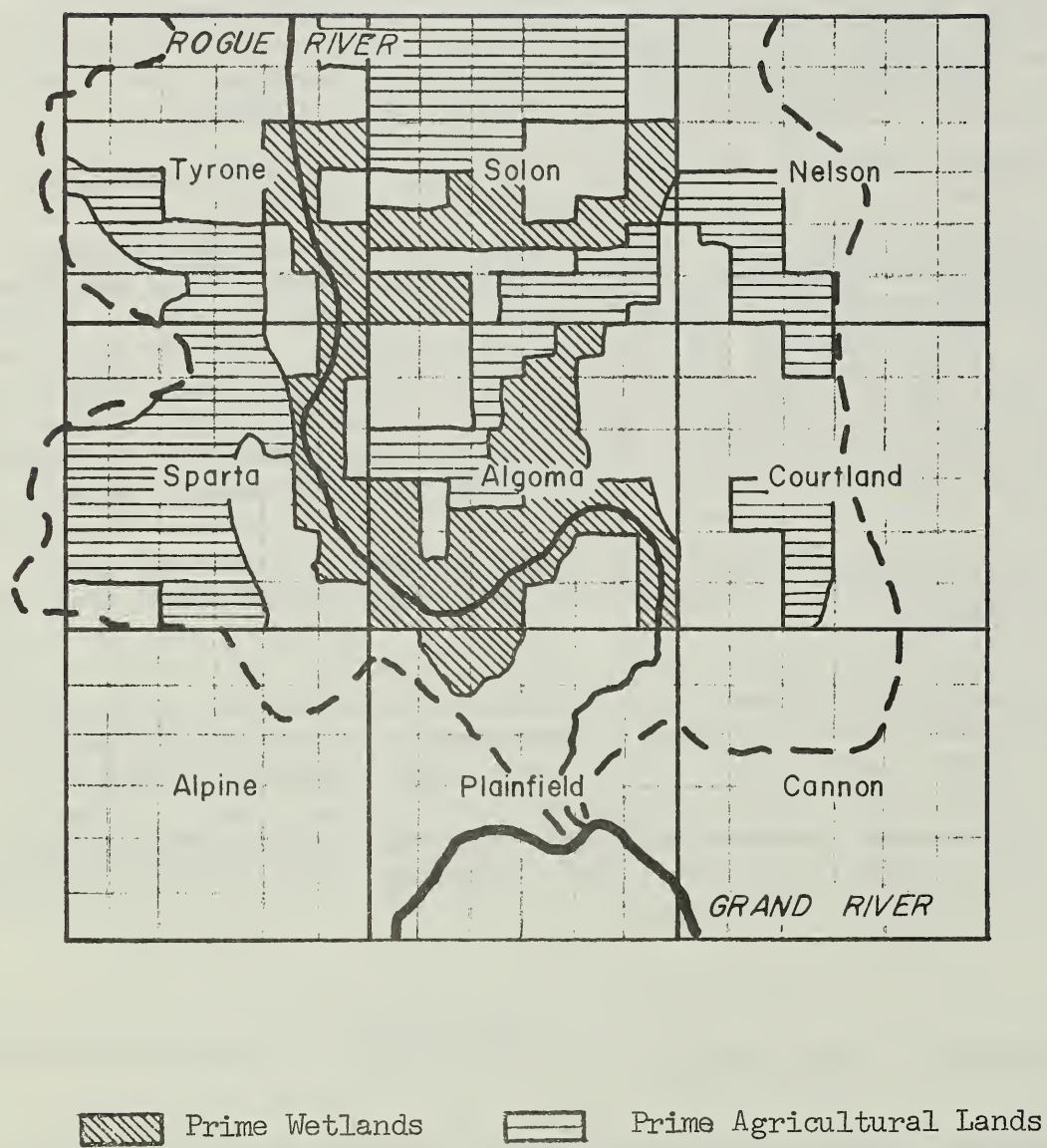


FIGURE 1 - SOIL SURVEYS FOR PRIME LANDS IN KENT COUNTY
PORTION OF ROGUE RIVER WATERSHED

Structural measures planned include approximately 11.6 miles of multiple-purpose (flood prevention and drainage) channel work, 1.7 miles of bank stabilization (for erosion control), a 60,000 gallon per minute pumping station, 7 water level control structures, and 2 debris basins. All stream channels were previously modified in the early 1900's with additional minor clean-out of parts over the years, some as recently as February 1973. (The location of these measures are shown on the project map in Appendix B.)

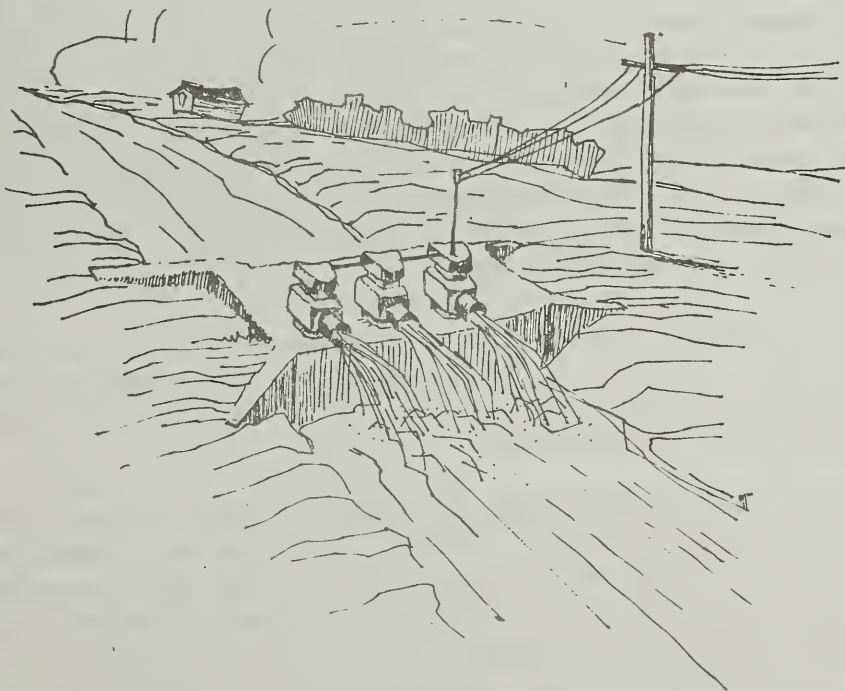


FIGURE 2 - PUMPING STATION IN REACH II

Included for the planned work are the following construction items and estimated quantities: clearing and grubbing, 22 acres; clearing, 81 acres; channel excavation, 472,000 cubic yards; surface water inlets for erosion control, 190; tile outlets, 129; rip-rap, 300 cubic yards; toe drains which include excavation and placing of one cubic yard of gravel per foot, 7,360 feet; diversion ditches, 47,400 feet; seeding and mulching, 191 acres; tree and shrub plantings, 12.8 acres; one bridge replacement on the Danials Creek Drain; farm crossings, 12; debris basins, one on the Danials Creek, and one on the Rogue River.

Surface water inlets, replacement of tile outlets, and daily and permanent seeding will be provided for erosion control. Surface water inlets will be provided for nonerosive entry of surface waters into the drains. (See Figure 7.) Similarly, existing tile outlets will be replaced when damaged in construction to afford safe entry of water from subsurface drains. To counter the effects of channel scour and channel slope and berm erosion, daily seeding of all excavated channel side slopes will be done for the portion completed that day. Species such as creeping red fescue, Kentucky bluegrass, redtop, timothy and birdsfoot trefoil will be used. A permanent seeding and mulching will be applied to the berm, spoil banks, borrow areas, and other areas exposed including repairing daily seedings after completion of the final shaping operation. In addition to erosive control, all seeded areas will be preserved for wildlife use.

Requirements for safety and health in conformance with the Federal Construction Safety Act of 1969 (PL 91-54) will be included in each construction contract. Design and construction of all measures will comply with all applicable state laws.

The Rogue River Watershed Project has been coordinated with the State Historic Preservation Officer. The Michigan History Division has conducted an investigation of the area. There are eight possible archeological sites within the watershed project area. However, none are within the planned construction area.

Installation of the project will not encroach on any known archeological, architectural, scientific or historic data, sites or specimens. There are no properties included in or eligible for inclusion in the National Register of Historic Places. The project will not result in the transfer, sale, demolition or alteration of any federally owned properties, or eligible National Register properties, nor will it contribute to the preservation and enhancement of non-federally

owned districts, sites, buildings, structures and object of historical, architectural or archeological significance. If artifacts are uncovered during construction, the Michigan Historic Preservation Officer, the Michigan History Division and the United States Secretary of the Interior will be notified.

ROGUE RIVER

Reach I, 1.8 miles in length, is a modified stream with a drainage area of approximately 38 square miles. A typical channel cross-section has a top width of 55 feet, a depth of 12 feet, and a 22 foot bottom width. The channel slopes are covered with a moderate growth of tall grasses, brush and a few trees. Flow condition is perennial. Reach I, extending for 1 mile from 136th to 128th Streets, runs through clay till overlain by 11 feet of sand. The remainder of the reach is in sand. Channel sloughing from seepage occurs on approximately 5,600 feet of the channel bank. Reach I lacks capacity and depth to provide a proper outlet for the drainage area and will be modified by deepening about one foot and widening to provide flood capacity and drainage outlets. A lowflow channel will be constructed to contain normal flows (Figure 3). This will minimize surface area and keep water temperatures low.

Construction alignment will follow that of the February 1973 local cleanout, i.e., on the west side of the channel from 136th to 128th Street and on the east side from 128th Street to the Kosten Drain. Construction and spoil placement will be on one side only. The opposite bank and berm will be preserved in its present state where stable conditions exist. After spoil bank shaping and seeding have been accomplished, two rows of trees and one row of shrubs will be planted on the spoil for erosion control. This will also have the effect of providing wildlife habitat, shading the stream, and enhancing aesthetics. A 5,600 foot seepage and sloughing problem is anticipated from 900 feet north of 136th Street to 500 feet north of 128th Street. To control the problem a toe drain or tile interceptor will be provided to stabilize the banks. A debris basin at the foot of the reach will be the first structural measure of the project to be constructed (Figure 4). Its primary purpose is to trap sediment resulting from construction and the resulting stabilization period. It is anticipated that project stabilization measures will prevent further sedimentation and scour problems in the project area. The debris basin will be cleaned out at the

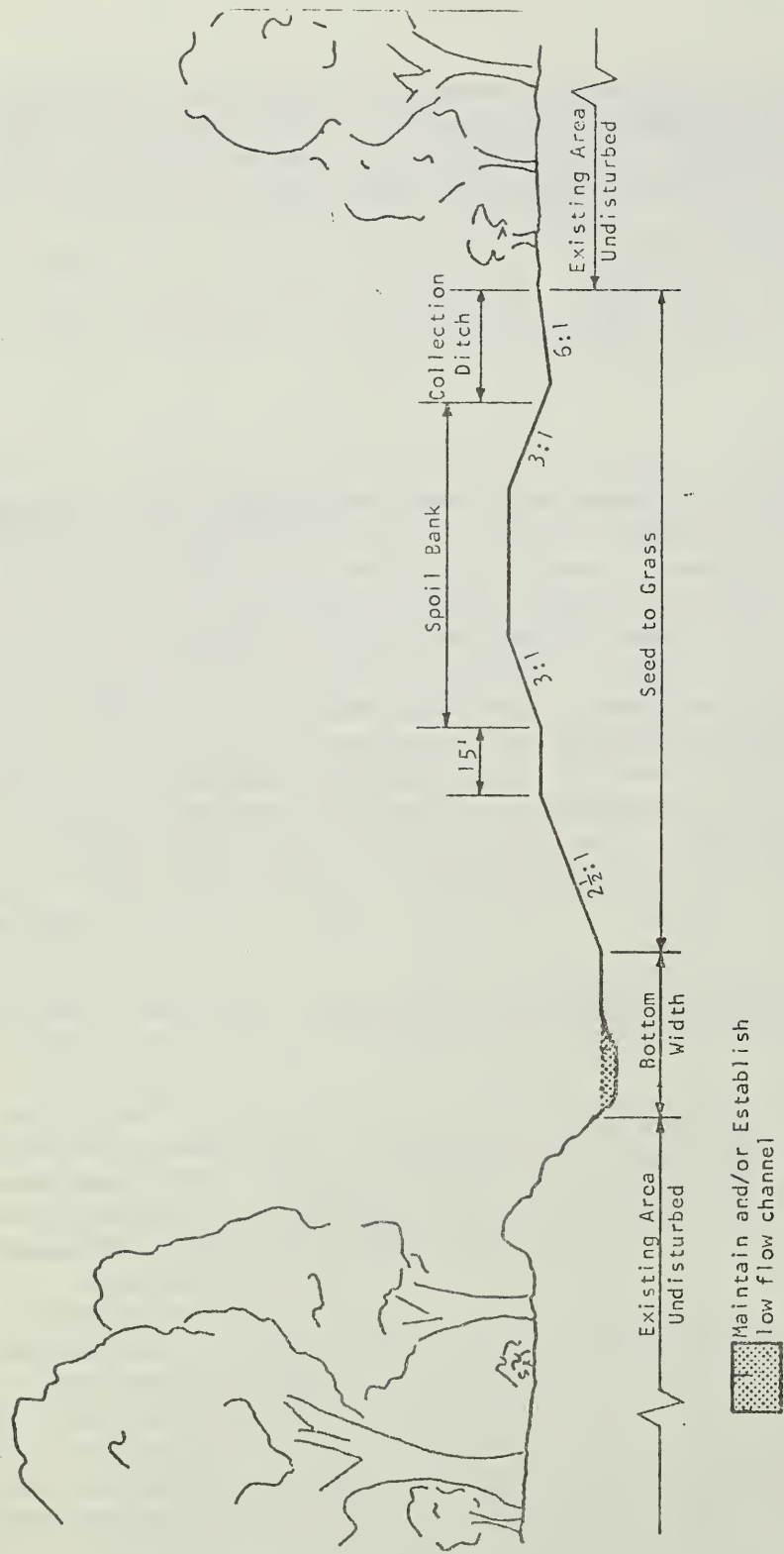


FIGURE 3 - TYPICAL CHANNEL CROSS SECTION REACH I
(WOODED AREA)

completion of construction and will be maintained by the Rogue River Inter-County Drainage Board. During the construction period a straw baffle to collect silts and clays will also be established and maintained in the lower portions of the basin or at another suitable location.

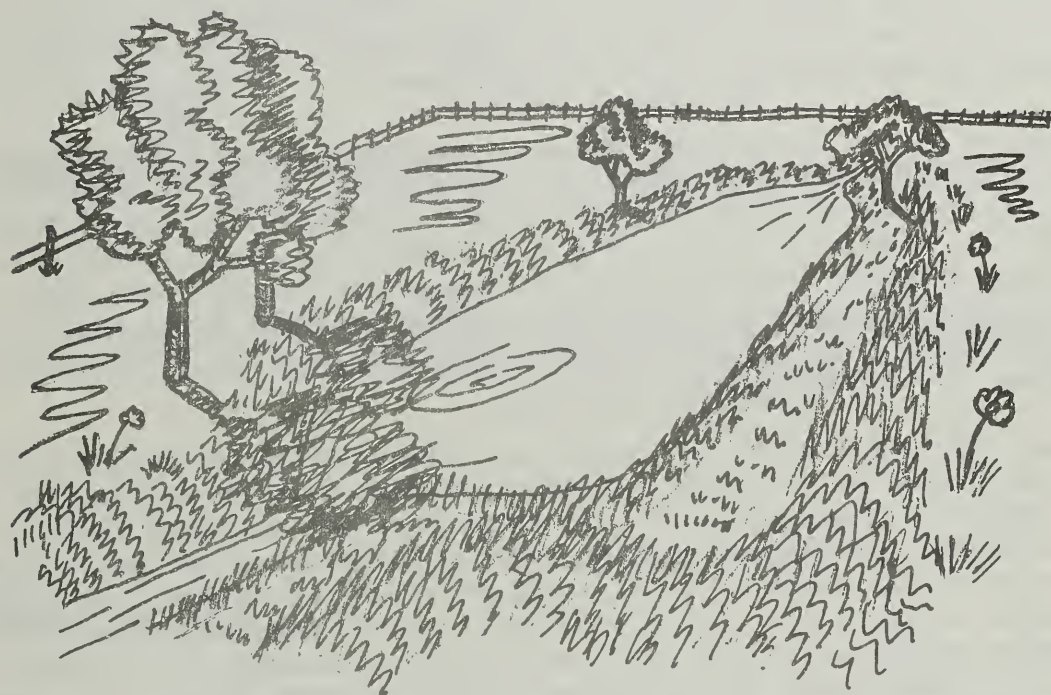


FIGURE 4 - DEBRIS BASIN

Spoil bank plantings for erosion control will be made in specific spots along the Rogue River in Sections 23 and 26, T 11 N, R 12 W. These areas will be treated by planting one row of shrubs next to the channel, then two rows of trees. Shrub varieties such as Autumn Olive, *Spirea Vanhoutteii*, Amur Privet, Silky Dogwood, and Highbush Cranberry will be used. The shrubs will be planted at an approximate rate of 1,760 shrubs per mile. Twenty to 150 plants of a species will be

planted together before changing species in the row. Species such as Pin Oak, Norway Spruce and Eastern Red Cedar will be planted in the two tree rows. They will be planted at a rate of about 880 per mile. Species will be changed from one row to the next and 10 to 75 of one species will be planted together before changing species in the row. There will also be spots of supplementary plantings along approximately 1.25 miles of the Rogue River in Section 35, South of 136th Street. This will involve space planting of about 2,000 shrubs of appropriate species in groups of one or two species for erosion control. Plantings will also provide food and cover for wildlife.

Reaches II and III are 3.1 miles of man-made channel constructed in about 1915 to drain the former Rice Lake area. Flows in these reaches are perennial. The average channel cross-section within Reach II is 40 foot wide at its top and 8 feet deep. The channel bottom is approximately twelve feet in width and slopes are covered with tall grasses. Bank instability along Reach II has resulted in incidents of bank sloughing. A 1 to 3 foot band of marl extends 2 to 3 feet below the surface in a sand channel.

Reach II is 0.6 miles in length and serves as the connector and outlet for 6.8 miles of multiple-purpose channel work in the problem area. (Refer to Figure 5.) It will be widened and deepened about 1.5 feet. A 60,000 gpm pumping station will be constructed and maintained at the foot of the reach. With floodwaters from the Ransom Lake contributing area diverted down the floodway diversion (Reaches VI and VII), the pumping station will have the capability of removing 0.5 inches of runoff in 24 hours from its 9.86 square mile drainage area, 3.97 square miles of which are in the highly fertile problem area.

The typical channel cross-section within reach III is 35 feet wide at its top with a 10 foot bottom and 5 feet of depth. The channel slopes are covered with a moderate growth of tall grasses. Reach III is 2.5 miles in length and extends to Ransom Lake, draining a major portion of the problem area. Although the channel condition is stable, it lacks depth for adequate drainage. Reach III's soil profile consists of 0.5 to 4 feet of muck overlaying calcarious silt.

Reach III includes 2.5 miles of multiple-purpose channels. Work will consist of bottom cleanout of 1 to 6 feet and bank shaping to establish adequate drainage depth. Construction will be performed from the east bank. A 15 foot grassed berm will be established and maintained. In addition, spoil and other disturbed areas will be seeded. Spoil will be spread to minimize lost cropland. Also included is a

gated embankment just downstream from the diversion channel. The gated embankment will be opened to permit water to flow to the problem area in times of low flow. A structure will be constructed in the vicinity of station 550+00 for water level control.

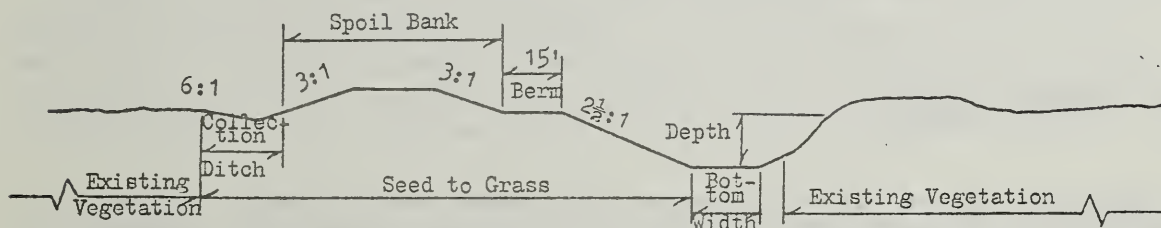


FIGURE 5 - TYPICAL CHANNEL CROSS SECTION CENTERLINE DRAIN
AND ROGUE RIVER REACH IV AND REACH II
(AGRICULTURAL AREA)

CENTERLINE DRAIN

Reach IV consists of 1.9 miles of man-made channel constructed about 1915 to drain the Rice Lake area. The drainage area of this reach is about 8.6 square miles. The upper 1.3 miles has intermittent flow while the lower 0.6 miles has perennial flow. Present channel configuration is about 32 foot top width, 6 foot depth with a 10 foot bottom width. Bank slopes are unstable with extensive sloughing. Reach IV has a soil profile consisting of 2 feet of calcareous sandy loam, and one foot of muck underlain by calcareous clay. There is very little gradient--only 2 feet in 1.9 miles.

A pumping station currently is located at the outlet of Reach IV to pump flood flows, to provide drainage and to prevent backup from the Rogue River. Present depth of the channel is inadequate for drainage and the pumping station lacks capacity to handle flood flows. This pumping station will be removed.

Planned work for Reach IV is 1.9 miles of multiple-purpose channel work. About 3,400 feet in the lower portion will be widened and deepened (see Figure 5), while the remaining part from station 583+00 to station 516+50 will be deepened. Depths will be increased an average of 0.8 feet. A 15 foot seeded berm and shaped spoil bank will be constructed on the east bank (Figure 3).

WEST BRANCH DRAIN

Reach V, is a man-made channel constructed about 1915 and has intermittent flow. The reach length is 0.7 miles. A typical cross-section has a top width of 20 feet and is 4 feet deep. Side slopes are grass covered. Soils consist of 2 feet of muck underlain by sand. Planned work will be channel deepening of about 1 foot. A water level control structure will be installed to maintain desired water levels (Figure 6).

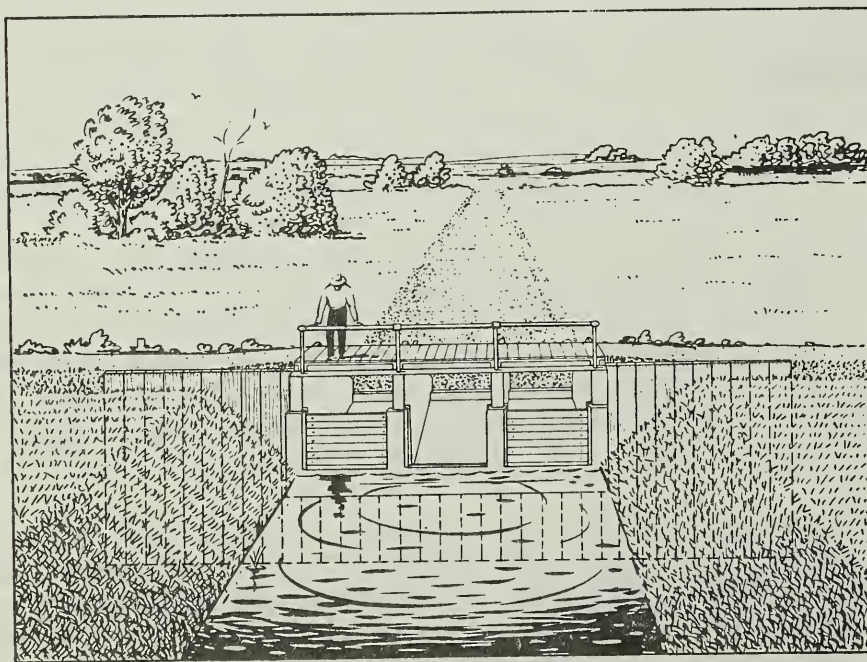


FIGURE 6 - WATER LEVEL CONTROL STRUCTURE

WALTERS DRAIN

This 1.1 mile reach is also a part of Reach V. It is an intermittent, previously modified channel. Soil profile in this area is two feet of calcareous sandy loam and one foot of muck underlain by calcareous clay. An average cross section has a top width of 32 feet, a 6 foot depth, and a bottom width of 10 feet.

Channel work in this reach will consist of 1.1 miles of deepening of 1.5 feet. Three water level control structures will be installed to maintain desired water levels.

Other stabilization items have been included as part of the construction measure which they protect. Channel windbreaks will be planted along 3.5 miles of the Centerline Drain, the Rogue River and the new diversion channel in Sections 13, 14, and 15, T 11 N, R 12 W. These will be installed north-south along the eastern edge of the channels. Also, 0.25 miles of windbreak will be installed along the east side of the airport in Section 15, T 11 N, R 12 W. Windbreak plantings will be of northern white cedar, Norway spruce or comparable species.

Eight new non-replacement farm crossings are planned for Reaches IV and V plus an average of 12 surface water inlets per mile (Figure 7). Adequate tile outlets will provide drainage for the problem area while protecting the channel from erosion.

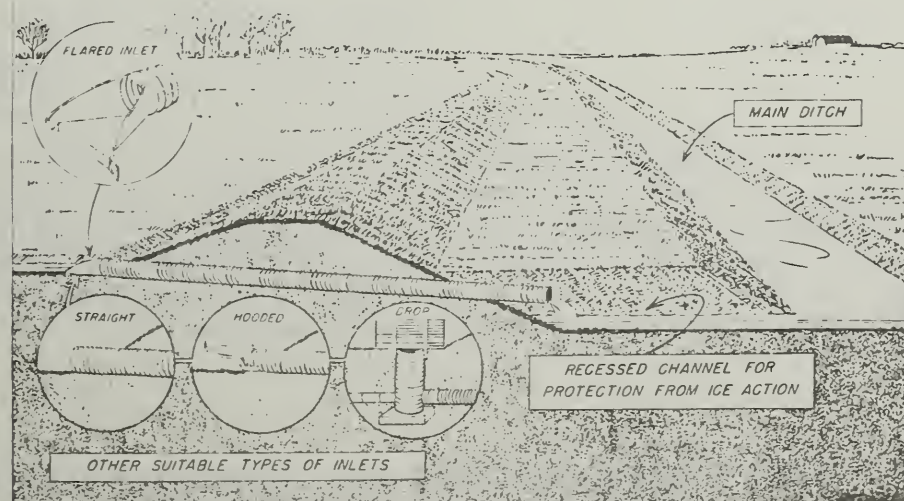


FIGURE 7 - SURFACE WATER INLET

KOSTEN DRAIN

Reach VI is 0.8 miles of previously modified stream passing along the Rice Lake beach ridge. It has perennial flow and drains 6.1 square miles. A typical channel section has a top width of 30 feet, a bottom 8 feet wide and a depth of 5 feet. Channel side slopes are moderately covered with tall grasses and brush. The lower 2,200 feet of the reach is sand. Upstream there is 0.5 feet of muck with a varying layer of marl 1 to 5 feet deep underlain by sand. This reach is generally stable, however, spots of active scour and sloughing degrade its quality.

Reach VI will be widened and deepened about 3.5 feet as a multiple-purpose channel (Figure 8). A low flow channel will be established to preserve low flow characteristics similar to present conditions so as to not adversely affect water temperatures in low flow periods. Reach VI will provide a diversion for flood waters from the Ransom Lake contributing area and the problem area east of Oak Avenue. Spoil will be placed on the north bank of the Kosten Drain to afford further protection of the problem area against overbank flows. A 15 foot seeded berm will be maintained on the north bank. A 40 foot strip will be preserved on the south side and planted to trees and shrubs for erosion control. This will have a favorable incidental effect on wildlife habitat, stream shading and aesthetics. An allowance for toe drains will be provided to handle seepage problems where found.

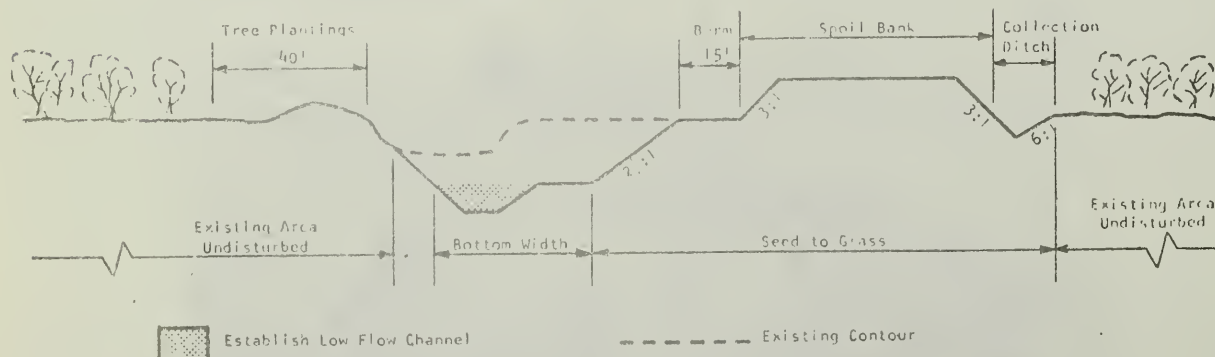


FIGURE 8 - TYPICAL CHANNEL CROSS SECTION KOSTEN DRAIN REACH VI
(NON-WOODED - SCRUB BRUSH)

DANIALS CREEK DRAIN

Danials Creek Drain is also a part of Reach VI. It extends upstream from the Kosten Drain for approximately 0.5 miles. It too is a previously modified stream with perennial flow. The soil profile consists of 0.5 feet of muck with a varying layer of marl 1 to 5 feet deep underlain by sand. This segment of Reach VI is generally stable, however spots of active scour and sloughing also occur.

Channel deepening of about 5.5 feet and widening will be done in this reach. A low flow channel will be established to preserve low flow characteristics and maintain cool water temperatures. Spoil will be placed on the north bank and a 15 foot seeded berm will be established and maintained. A 40 foot strip will be preserved on the south side and planted to trees and shrubs for erosion control.

The existing Oak Avenue bridge will be replaced. A debris basin will be constructed at the upstream of this reach. An allowance for toe drains will be provided to handle seepage problems where found. A rip-rap drop structure will provide a non-erosive drop in grade at station 578+00 and allow fish passage upstream.

Bank stabilization and spoil plantings are planned on 1.7 miles of the Danials Creek Drain and its tributaries in Section 24 of T11N, R12W, and in Sections 19 and 30 of T11N, R11W. Unstable banks will be graded to a slope of 3:1. Tile drains will be installed to intercept seepage. One hundred ninety cubic yards of rip-rap will be installed. Both banks of the channel, wherever disturbed, will be reseeded with grasses.

DIVERSION

Reach VII, 1.7 miles in length, extends from the Danials Creek Drain to the Rogue River west of Ransom Lake. Approximately 0.5 miles is presently a farm drain, about 20 feet wide at its top and .5 feet deep, extending northwest from 120th Street. Soils are primarily sand. From approximately 1,000 feet north of 120th Street northward, there is a 1.5 foot surface layer of muck underlain by sand.

Reach VII will be constructed from the Rogue River near the Ransom Lake outlet, south to the Danials Creek Drain to handle flood flows. Depths will be increased 2.5 to 7 feet. Spoil and 15 foot grassed maintenance berms will be established on each bank. A new road crossing and two water level control structures will be constructed. One will be at 120th Street and the second near station 491+00. Needed farm crossings will be constructed to provide access to lands separated by the diversion. Some channel seepage and resulting sloughing is anticipated. Toe drains (gravel filters or drain conduits to dewater an area without soil movement) will be constructed to minimize this effect when encountered.

OPERATION AND MAINTENANCE

Land treatment measures will be operated and maintained by individual landowners or farm operators. This will be accomplished under cooperative agreements with the soil conservation district. Technical assistance will be provided by the Soil Conservation Service and for forestry measures, by the Michigan Department of Natural Resources, in cooperation with the U.S. Forest Service under cooperative forestry programs.

An establishment period not to exceed three years is provided for the structural work and associated vegetative cover. During this period the Soil Conservation Service may use PL-566 funds to cost share on any repairs or other work resulting from unknown site conditions or latent defects. The cost of repairs will be shared in the same ratio as the original structure. Cost of work under this provision will be limited to 10 percent of the contract cost. Type of work includes minor structural measures such as reshaping of the constructed channel and rock toes, and prompt establishment of adequate vegetative cover.

The continued functioning of the multiple-purpose channel work and pumping station in providing the degree of flood protection and drainage for which they were designed and for serving as adequate outlets will require a timely maintenance program. This will require the control of undesirable vegetal growth by mowing and/or spraying; resloping of eroding banks; removing sediment bars from channels; and removing debris from pipes, trash racks, and pumps.

Annual operation and maintenance costs total an estimated \$12,390 for all project measures, \$1,600 of which concerns the nonstructural flood plain management and \$10,790 of which concerns planned structural measures. Nonstructural O&M will be sponsored and paid by the appropriate township, village and city entities. Structural O&M will

be sponsored and paid by the appropriate Drain Commissioners (and the Intercounty Drainage Board in the case of the Rogue River).

The appropriate Drain Commissioners (and the Inter-County Drainage Board in the case of the Rogue River) will operate and maintain the planned channel works and other structural measures. Annual operation and maintenance costs total an estimated \$10,790 for the project.

The following items will be provided for in the maintenance program:

1. A specific maintenance agreement between the Soil Conservation Service and the appropriate sponsoring organization will be executed prior to the issuance of an invitation to bid on construction contracts.
2. A joint inspection will be made annually or after unusually severe floods by representatives of the sponsoring organizations including those in the Drainage District having responsibility for the works of improvement to be installed. Representatives of the Soil Conservation Service will assist with these inspections. A record will be made of all inspections, with one copy for the sponsoring organization and one copy for the Soil Conservation Service.
3. After an initial three-year period of joint inspection, the inspections of the structural works of improvement will be made annually by the sponsors, and a copy of the report prepared by them will be sent to the Soil Conservation Service representative.
4. All costs for labor, equipment and materials for operation and maintenance will be furnished by the appropriate local sponsoring organization.
5. Maintenance rights-of-way to the structural measures will be furnished by local sponsoring organization.
6. Maintenance work on seeded areas by mowing or spraying with environmentally safe chemicals should be done at a time which will allow for completion of the nesting season, preferably after July 15.
7. Sponsoring city, village and townships will monitor and enforce zoning ordinances and other flood plain management measures.

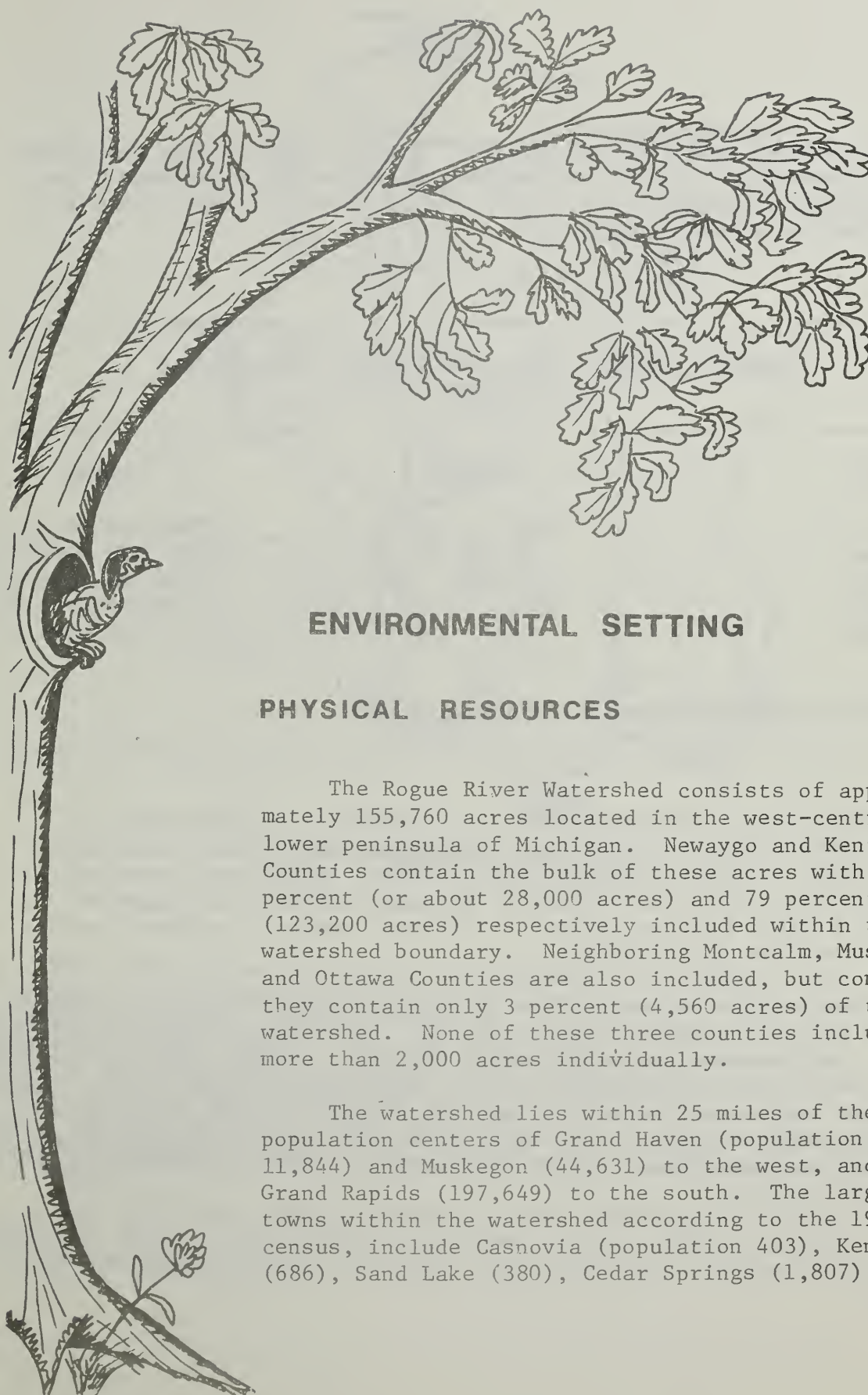
PROJECT COSTS

Project installation costs total \$2,831,565, with PL-566 funds supplying \$1,827,175 and other funds providing \$1,004,390. Table 7 indicates a more detailed division of project costs.

TABLE 7 - TOTAL PROJECT COSTS

	<u>PL-566 Funds</u>	<u>Other Funds</u>	<u>Total</u>
Land Treatment	\$ 194,175	\$ 611,025	\$ 805,200
Non-Structural Measures			
Engineering Services	31,500	-0-	31,500
Project Administration	-0-	15,000	15,000
Structural Measures			
Construction	1,325,980	51,320	1,377,300
Other (Engr. Serv., Land Rights, Proj. Admin.)	275,520	327,045	602,565
Total Project	\$1,827,175	\$1,004,390	\$2,831,565

Price Base, 1974



ENVIRONMENTAL SETTING

PHYSICAL RESOURCES

The Rogue River Watershed consists of approximately 155,760 acres located in the west-central lower peninsula of Michigan. Newaygo and Kent Counties contain the bulk of these acres with 18 percent (or about 28,000 acres) and 79 percent (123,200 acres) respectively included within the watershed boundary. Neighboring Montcalm, Muskegon and Ottawa Counties are also included, but combined they contain only 3 percent (4,560 acres) of the watershed. None of these three counties includes more than 2,000 acres individually.

The watershed lies within 25 miles of the population centers of Grand Haven (population 11,844) and Muskegon (44,631) to the west, and Grand Rapids (197,649) to the south. The larger towns within the watershed according to the 1970 census, include Casnovia (population 403), Kent City (686), Sand Lake (380), Cedar Springs (1,807),

Sparta (3,094), and Rockford (2,438). Smaller towns within the watershed include Sun, Belmont, Childsdale, Englishville and Lisbon. The urban and rural populations of the five counties included within the watershed are shown in Table 8.

TABLE 8 - COUNTY POPULATION FIGURES (AND PERCENT
CHANGE SINCE 1960)

<u>County</u>	<u>Urban</u>	<u>Rural</u>
Kent	342,261 (+15.6)	68,783 (+ 2.4)
Newaygo	3,465 (+ 2.4)	24,527 (+18.1)
Ottawa	61,921 (+35.5)	66,269 (+24.9)
Muskegon	108,733 (+ 8.2)	48,693 (- 1.6)
Montcalm	7,493 (+ 0.7)	32,167 (+13.4)

Source: Michigan Statistical Abstracts, 1970.

There are 16 townships within the watershed of which only two (Algoma and Solon) are entirely in the study area. (See Figure 9.) Major parts of Grant, Ensley, Tyrone, Nelson, Sparta and Courtland Townships are within the watershed boundary and minor acreages of Brooks, Croton, Pierson, Casnovia, Chester, Alpine, Plainfield and Canon Townships are included.

The watershed is part of the Grand River Basin found in Subarea 3 of the Great Lakes Water Resource Region. It is also Southern Michigan Drift Plain of the Lake States Fruit, Truck, and Dairy Region as defined in the Soil Conservation Service, USDA, Agriculture Handbook 296, "Land Resource Regions and Major Land Resource Areas of the United States." The watershed is also included within the 10 counties making up State Planning and Development Region 8 as defined in 1972 by the Michigan Governor's office.

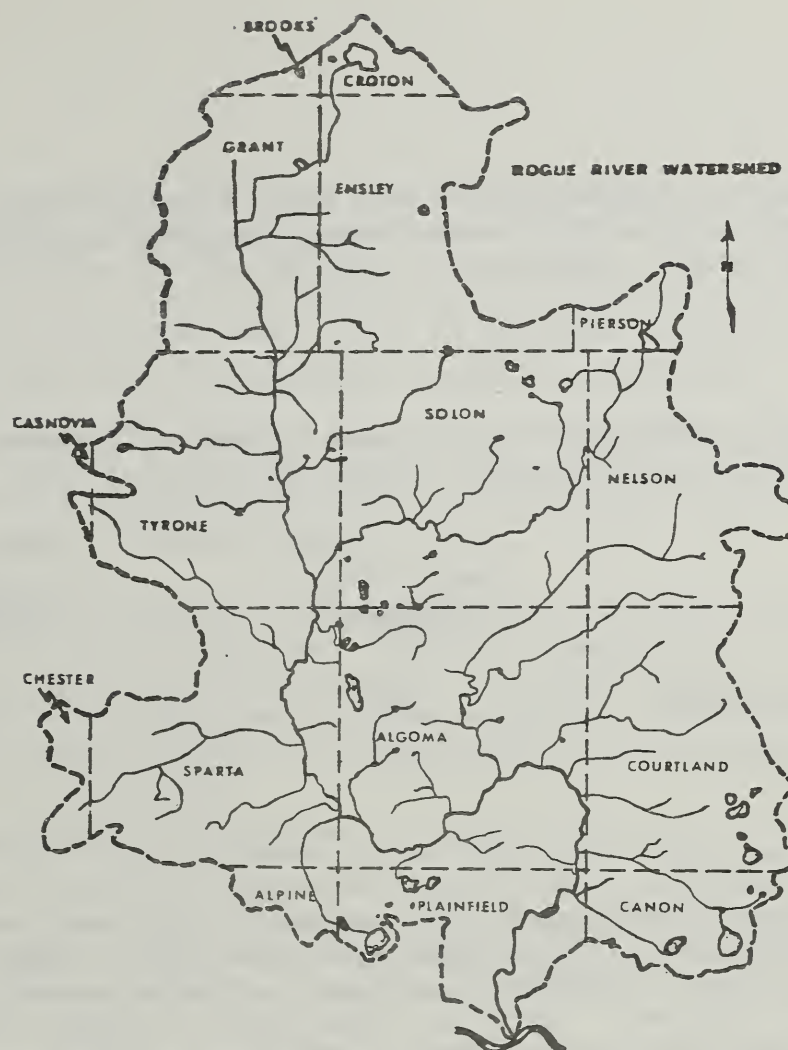


FIGURE 9 - TOWNSHIP BOUNDARIES

Mean annual precipitation is approximately 32 inches in the watershed. Approximately 112 miles (48 percent) of the 237 miles of coldwater streams in the Grand River Basin are located within the area around Grand Rapids. Land use comparisons, as indicated in Table 9, show a greater percentage of land delegated to pasture and wildlife, but a lower percentage of woodland in the Rogue River Watershed. Because of the different base years, it is not clear whether these differences are due to time, location or a combination of both.

Soil and water resource problems in the watershed are similar in nature to those of the entire Great Lakes Region. These problems are erosion and sedimentation, flooding, and competition for land from

various sources. Specifically in the Rogue River Watershed problems of streambank erosion, floodwater damage, impaired drainage, and erosion and sediment damage occur.

TABLE 9 - COMPARISON OF LAND USE IN REGION AND WATERSHED

<u>Land Use</u>	<u>Great Lakes Region-1960 (Percent)</u>	<u>Rogue River Watershed-1970 (Percent)</u>
Cropland	27.4	30
Pasture and Wildlife	10.9	30
Woodland	48.1	30
Miscellaneous	13.6	10

The major problem area in the watershed is located just east of the community of Grant. This 3,660 acre basin area, formerly Rice Lake, is presently farmed intensively, although poor drainage and flooding are recurrent problems. Specialty crops such as onions, carrots, parsnips and celery are grown on about 3,380 acres of this area, with muck soils (Warners and Edwards) predominating.

GEOLOGY

The entire watershed is covered with glacial drift deposited by the ice sheet. This drift is composed of a mixture of rock and soil from local sources and from areas to the north. Thickness of the drift is between 50 and 200 feet and therefore the underlying bedrock does not have any influence on its composition. There are no dominant rock types in the drift although limestone occurs in quantity. Marl deposits can be found in the watershed which has been used in place of agricultural lime; however, several marl mining operations in the area have been abandoned, presumably because of a lack of a suitable profit margin.

Beneath the drift are found four major geologic formations of the Pennsylvanian and Mississippian Period (Figure 10). These sandstones, limestones, and shales slope from west to east and vary in thickness from 0 to 500 feet. The Saginaw formation underlies the eastern third of the watershed and is little used as a source of groundwater since the overlying drift is very productive.

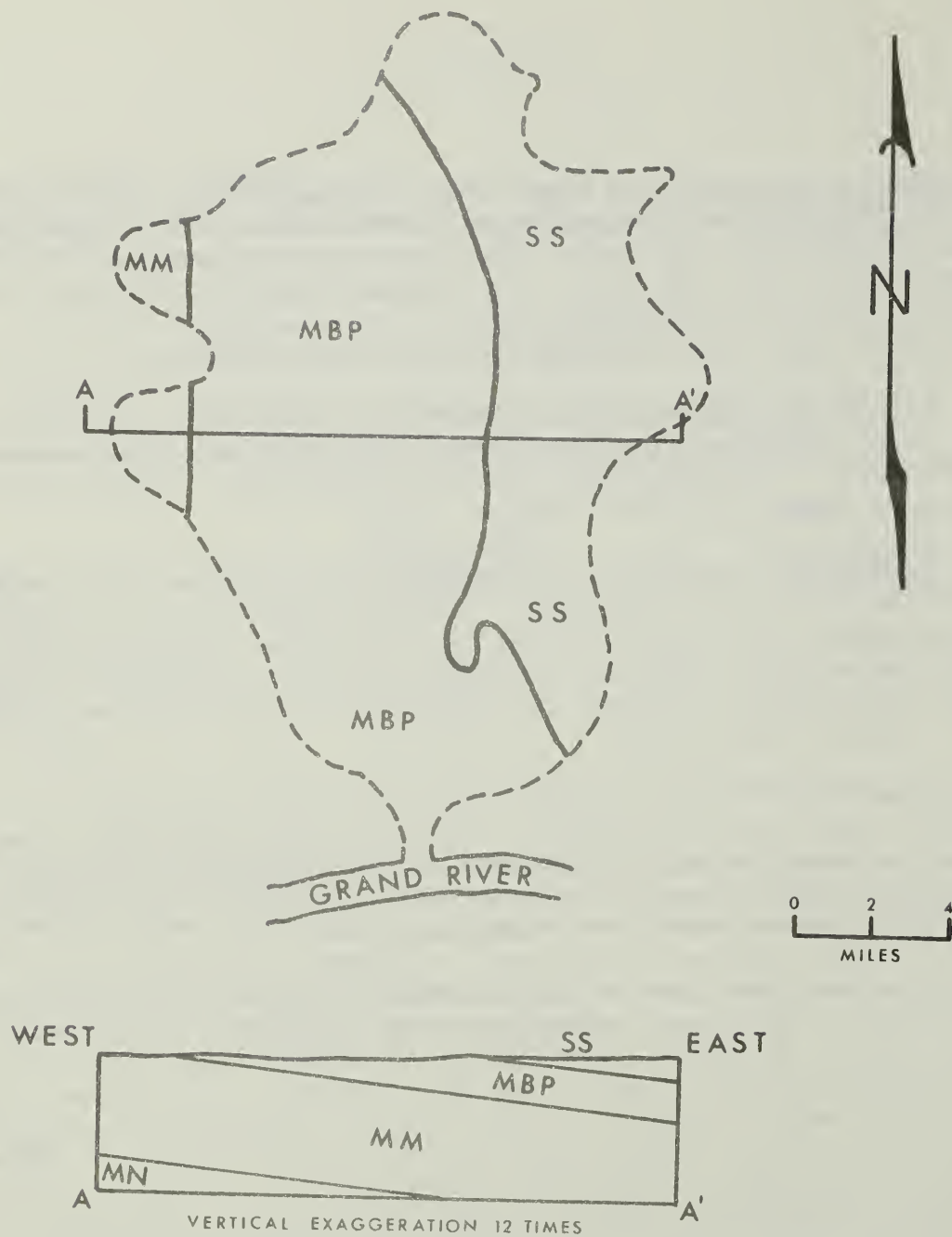
Data from the "Kent County Comprehensive Area-Wide Water and Sewer Plan" indicates that the Bayport limestone underlies parts of the southern and western portions of the watershed. Water yields can vary up to highs of 300-800 gpm.

The Marshall formation also underlies part of the southern and western section of the watershed. Composed essentially of sandstone, the upper part where overlain directly by glacial drift, is quite permeable and wells of 1,000 gpm have been developed. The water is hard, however, and causes staining. The lower part of the Marshall formation is highly mineralized.

Groundwater from the glacial drift throughout the watershed is in adequate supply since the drift is of sufficient thickness. However, most groundwater is high in iron and causes staining. Water also tends to be high in calcium chloride and sulphates. Over-pumping may draw highly mineralized water from other zones.

In the northern part of the watershed, glacial drift varies up to 400 feet in thickness. Large capacity irrigation wells are productive here. In general, however, an 8" diameter well will yield 100-500 gpm and vary in depth from 50 to 200 feet. In places, there are flowing wells. The glacial drift water is generally hard (200 ppm to more than 300 ppm calcium carbonate and iron). Bedrock: Red beds (gypsum, shale and red sandstone), Saginaw formation, Bayport limestone and the Marshall formation underly the drift in the watershed (Figure 10). The red beds are present in the extreme NE corner of the watershed. Its waters are hard and unsuitable for water supplies.

Within the watershed there are presently 30 producing oil wells and 12 producing gas wells. To date, 118 dry holes have been drilled and 5 oil wells have been depleted (Figure 11). In 1964 there were 20 sand and gravel pits in operation, although most are inactive or depleted today. Approximately 17 pits within the Rogue River Watershed are presently in limited operation. There is no other type of active mineral extraction in the watershed.



LEGEND
(Pleistocene Mantle Omitted)

- SS Saginaw Sandstone ---- Pennsylvanian Period
- MBP Bayport Limestone ---- Upper Mississippian Period
- MM Michigan Shales ----- Upper Mississippian Period
- MN Napoleon-Marshall Sandstone--Mississippian Period

FIGURE 10 - GENERALIZED GEOLOGIC MAP AND CROSS SECTION



FIGURE 11 - OIL, GAS AND MINERAL EXTRACTION LOCATIONS

The whole of the watershed was probably covered by the Lake Michigan ice lobe in the last glaciation (late Wisconsin). The land surface is therefore comparatively young. Topography in the watershed varies from near level to hilly, while surface elevations vary from approximately 610 mean sea level (MSL) at the downstream end of the watershed to 1,122 MSL in the headwaters.

Some areas of land are flat and undrained and large bodies of soil have therefore developed under conditions of high moisture. However, the perviousness and great thickness of many of the deposits have allowed the development of soils under low moisture conditions despite the level land surface in some areas.

Various wet and dry conditions on the upland moraines are largely the result of differences in the texture of the glacial debris and the constructional variations, such as depressions, which naturally receive drainage from the surrounding slopes.

SOILS

The general soil map in Figure 12 shows the soil associations in the Rogue River watershed. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and a number of minor soils, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in the area or to compare different parts of the area. It is not a suitable map for planning the management of a farm or for selecting the exact location of a road, building or other structure.

The following are brief descriptions of the soil associations in the Rogue River watershed:

Rubicon - Montcalm - Chelsea association: nearly level to gently sloping, well drained soils with loamy sand and sand surface layers; on till plains, outwash plains, moraines, and terraces. Includes land capability classes III, and VI. (See Appendix E for explanation of land capability classes.)

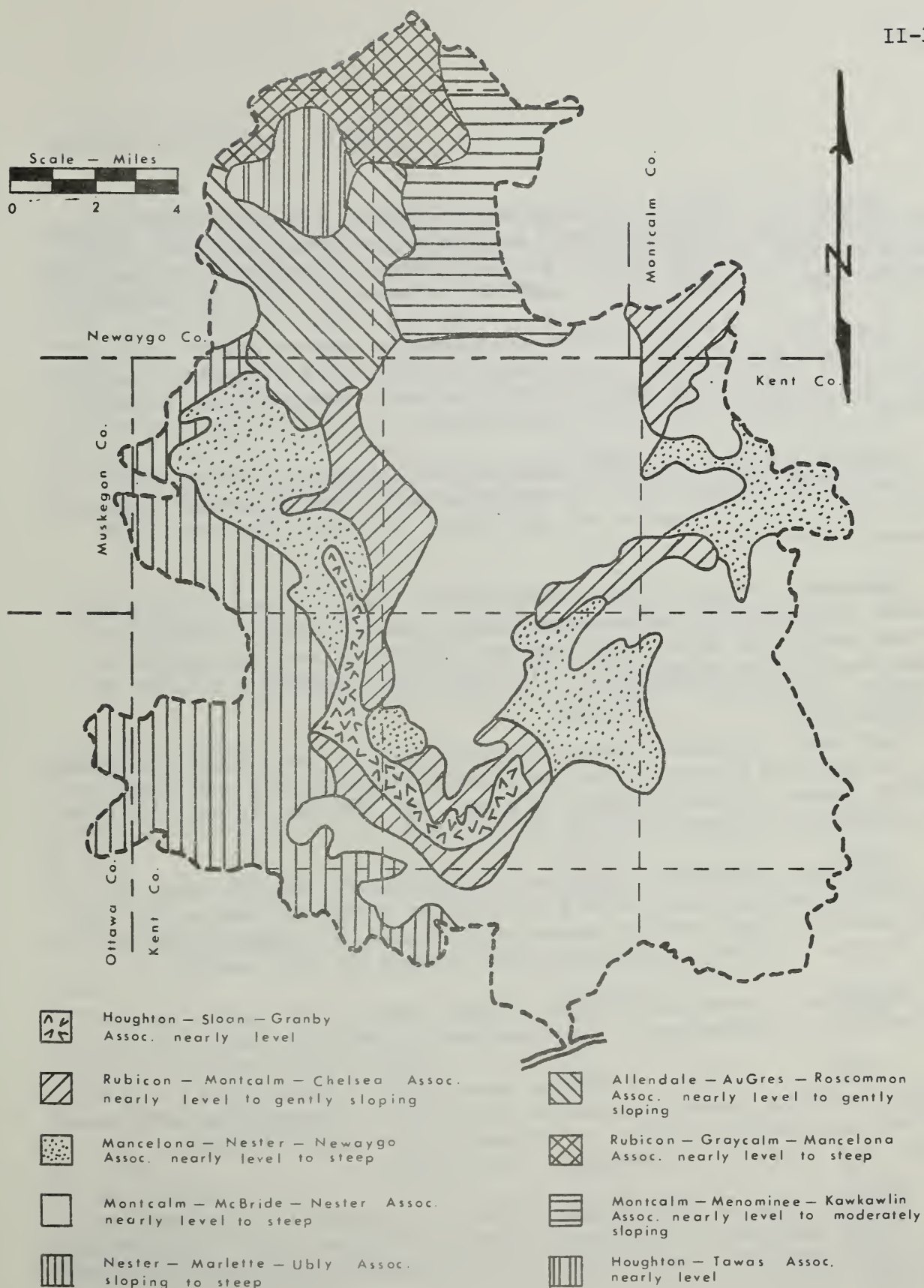


FIGURE 12 - SOIL ASSOCIATIONS IN THE ROGUE RIVER WATERSHED

Mancelona - Nester - Newaygo association: nearly level to steep, well drained and moderately well drained soils with loamy sand, loam, and sandy loam surface layers; on till plains, outwash plains, moraines, and terraces. Includes land capability classes II, III, IV, and VI.

Montcalm - McBride - Nester association: nearly level to steep, well drained and moderately well drained soils with loamy sand, sandy loam, and loam surface layers; on till plains, moraines, and outwash plains. Includes land capability classes II, III, IV, and VI.

Nester - Marlette - Ubly association: sloping to steep, well drained and moderately well drained soils with loam and sandy loam surface layers; on till plains and moraines. Includes land capability classes III and IV.

Houghton - Sloan - Granby association: nearly level, very poorly drained muck soils in depressions and very poorly drained and poorly drained soils with silty clay loam and loamy sand surface layers; on flood plains and outwash plains. Includes land capability classes IV, V and VI.

Rubicon - Graycalm - Mancelona association: nearly level to steep, well drained and moderately well drained soils with sand and loamy sand surface layers; on till plains, moraines, and outwash plains. Includes land capability classes III, IV, VI, and VII.

Montcalm - Menominee - Kawkawlin association: nearly level to moderately sloping, well drained to somewhat poorly drained soils with loamy sand and loam surface layers; on moraines, till plains and outwash plains. Includes land capability classes II, III, and IV.

Houghton - Tawas association: nearly level, very poorly drained muck soils; in depressions. Includes land capability classes IV and VI.

Allendale - Au Gres - Roscommon association: nearly level to gently sloping, somewhat poorly drained to very poorly drained soils with loamy sand and sand surface layers; on outwash plains and till plains. Includes land capability classes III, IV, and VI.

Smaller areas of Belding sandy loam are present in the northeast part of the watershed. This soil is 20 to 40 inches thick. It is somewhat poorly drained, nearly level to gently sloping and has a seasonally high water table.

CLIMATOLOGICAL DATA

Climatologic data for the watershed were obtained from National Weather Service stations at Newaygo and Grand Rapids. The Grand Rapids station lies immediately to the south of the watershed and is perhaps more indicative of conditions in the Kent County portion of the watershed. Data from the Newaygo station, located to the north of the watershed, are perhaps more appropriate to the problem area in Newaygo County. Pertinent climatologic parameters and their values for these two weather stations are given in Table 10. Because of the differing periods of record for these two stations (Newaygo, 30 years; Grand Rapids, 57 years), it is important to recognize that the maximum and minimum values are not comparable because of the extreme sensitivity of ranges to lengths of sample periods.

TABLE 10 - CLIMATOLOGIC DATA, ROGUE RIVER WATERSHED

	WEATHER STATION	
	<u>NEWAYGO</u>	<u>GRAND RAPIDS</u>
<u>Temperature (°F)</u>		
January Mean	22.3	23.5
July Mean	70.0	71.5
Maximum	110.0	102.0
Minimum	-31.0	-22.0
<u>Killing Frost (mean)</u>		
First	September 28	October 12
Last	May 25	April 25
<u>Length of Growing Season (mean)</u>	130	170
<u>Precipitation (inches)</u>		
Mean Annual	32.10	31.5
Minimum Annual	20.50	20.92
Maximum Annual	39.68	45.11
Maximum 24 hour	3.82	4.26
Percent of mean annual between March 31 and October 1	57%	58%

Average monthly precipitation historically has been uniform throughout the growing season (Figure 13). February has traditionally been the driest month, while May has been the wettest.

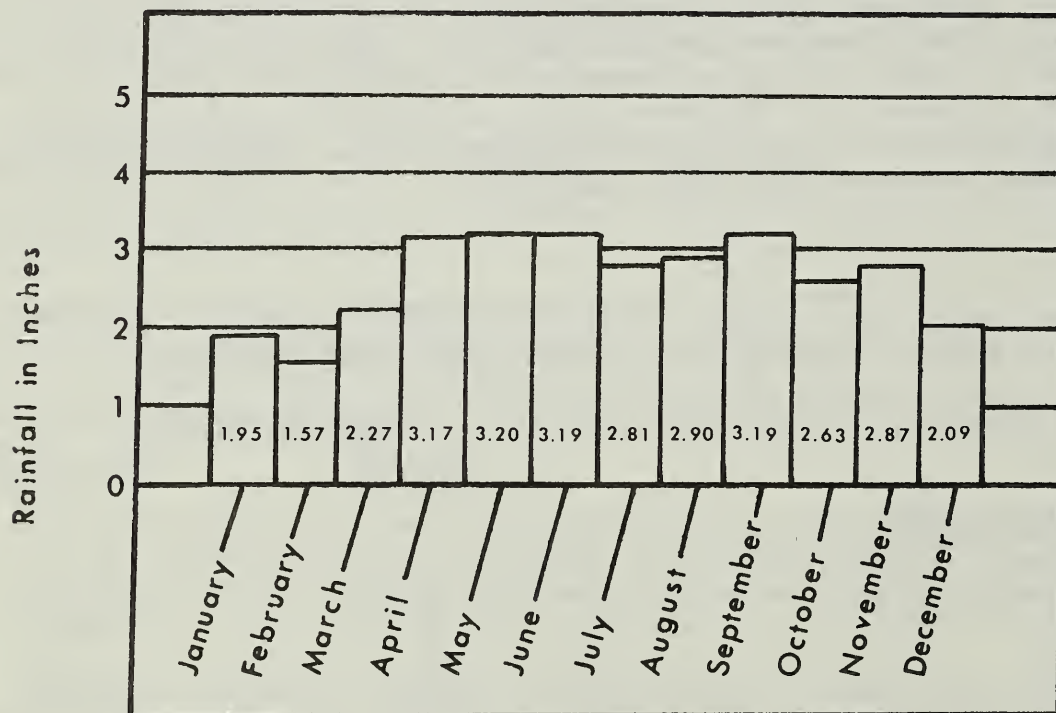


FIGURE 13 - MONTHLY PRECIPITATION, ROGUE RIVER WATERSHED, NEWAYGO COUNTY

LAND USE

Of the 155,760 acres in the watershed, 90 percent are divided equally into three use classifications: cropland, woodland, and pasture and wildlife (46,710 acres each). Other uses account for 10 percent of the land area, or 15,570 acres.

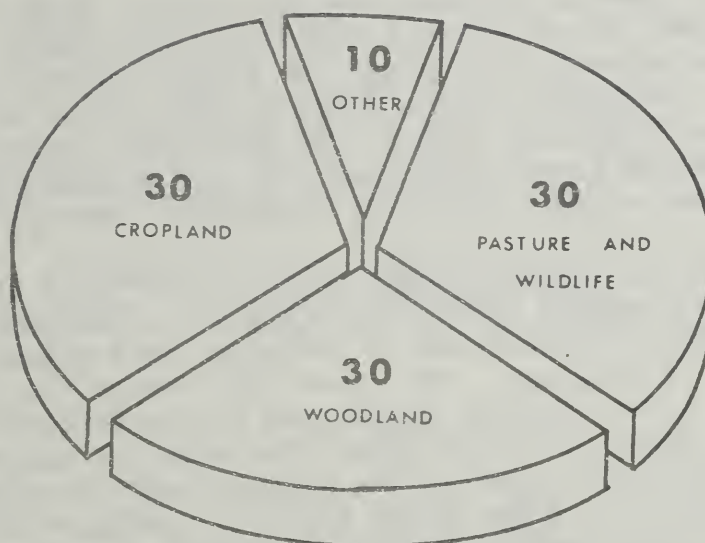


FIGURE 14 - LAND USES IN PERCENTAGES IN THE ROGUE RIVER WATERSHED

The forested land is found throughout the watershed but is concentrated along the Rogue River and on public land. The predominant forest type is oak-hickory (40%). Stands of beech-birch-maple (30%), elm-ash-cottonwood (4%), aspen-birch (4%), and oak-pine (8%) also occur. There are numerous conifer plantations found in the watershed amounting to about ten percent of the forest acreage.

The majority of the forest stands contain mature sawtimber (50%), are medium to well stocked and are of commercial quality. The remaining stands are in poles (35%) and seedling and sapling (15%) size classes.

WATER QUALITY

The major water course in the watershed is the Rogue River (originally called Rouge because of the reddish tint to its waters). It

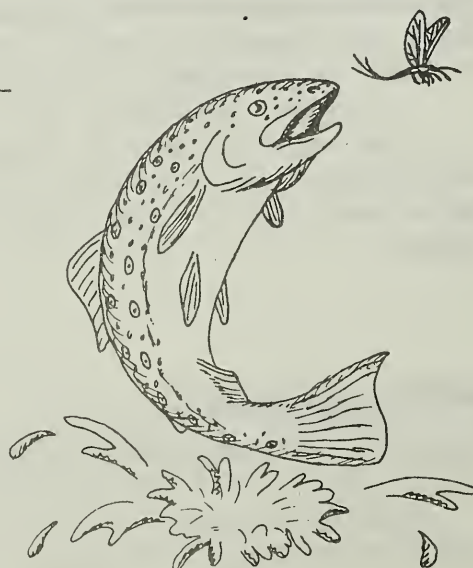
begins at Bill's Lake in southern Newaygo County, flows southerly through low, swampy areas and muck farms to Ransom Lake. After leaving Ransom Lake, the Rogue flows through the major problem area (Rice Lake Basin) and then continues its now manmade route south out of Newaygo County. Upon entering Kent County, the Rogue again enters a natural channel in the Rogue River State Game Area and meanders south, picking up in both volume and velocity as it intercepts numerous tributaries.

The Rogue River valley becomes more entrenched in Kent County; two dams in its lower reaches attest to this fact. The Rogue turns eastward near the town of Sparta before resuming its southerly course about two miles north of Rockford. The river then enters the Rockford Dam and continues about a mile further downstream to the Childsdale Dam. After leaving the Childsdale Dam, the river continues its course unimpeded for approximately 2 1/2 miles to its junction with the Grand River. The total course of the Rogue River from its source at Bill's Lake to the Grand River covers approximately 41 miles.

There are 232 lakes inundating 6,089 acres in the watershed according to the 1962 Lake Inventory Bulletins. These lakes vary from 0.1 to 237 surface acres in size. Some of the larger lakes are listed in Table 11. In addition, Soil Conservation Service records indicate that 377 and 493 ponds have been built in Kent and Newaygo Counties, respectively.

TABLE 11 - LARGEST LAKES IN THE WATERSHED

<u>Lake</u>	<u>Size (Acres)</u>
Silver	237
Bill's	204
Pettit	169
Camp	154
Bella Vista	150
Myers	126
Pine Island	120
Brower	85
Stoners	77
Freska	62



There are more than 150 miles of perennial streams in the watershed (Table 12). There are fifteen tributaries to the Rogue River in Kent County which are classified as second quality warmwater. An additional ten tributaries are classified as top quality coldwater plus one (Post Creek) classified as second quality coldwater. (See Appendix F.) All of these streams are protected for industrial water supply; partial body contact; tolerant fish, warmwater species; agricultural; commercial, and other uses. In addition, the coldwater streams are designated for anadromous fish runs. According to Michigan Water Standards, where waters are classified under more than one use designation, the most restricted standard will apply.

A qualitative bioassay of the benthic fauna of the Rogue River Watershed was made in July, 1974 (Figure 15). The pollution tolerant organisms (Figure 13) near stagnant water flows, and sand/muck substrates found at sampling stations 1-3 (Figure 16) collectively indicate low habitat diversity and water quality in the project area. The numbers of organism types collected and the pollution sensitivity of some of these types indicate an improvement in habitat diversity and water quality as the river flows southward.



FIGURE - 15 - BENTHOS SAMPLING

TABLE 12 - PHYSICAL PARAMETERS OF STREAMS IN THE ROGUE RIVER WATERSHED

Stream*	Location	Length	Channel Type	Flow Cond.	Base Flow (8/74)	Water Qual. Class.
Rogue River	West River Rd.	46 mi.	N	P	100	C
	12 Mile Rd. & Summit Ave.		N	P	100	C
	Indian Lakes Rd.		N	P	75	C
	22 Mile Rd.		M	P	30	W ²
	Peach Ave.		M	P	12	W ²
Barclay Creek	Northland Ave.	5 mi.	N	P	2	C
Stegeman Creek	13 Mile Rd.	9 mi.	N	P	15	C
Cedar Creek	13 Mile Rd.	19 mi.	N	P	15	C
	17 Mile Rd.		N	P	10	
Little Cedar Creek	White Creek Rd.	11 mi.	N	P	4	C
Nash Creek	M 37	10 mi.	M	P	2	W ²
Ball Creek	Sparta Rd.	10 mi.	M	P	2	W ²
Duke Creek	Division Rd.	20 mi.	N	P	15	C
	18 Mile Rd.		N	P	10	
Frost Creek	Algoma Rd.	5 mi.	N	P	2	C
White Creek	Egner Rd.	5 mi.	N	P	3	C
Spring Creek	Red Pine Dr.	8 mi.	N	P	15	C
Walter Creek	Sparta Ave.	7 mi.	M	P	2	C
Post Creek	20 Mile Rd.	4 mi.	M	P	2	C
Kosten Drain	Oak Ave.	4 mi.	M	P	10	W ²
Hickory Creek	22 Mile Rd.	3 mi.	M	P	1	W ²
Hilbrand Drain	22 Mile Rd.	2 mi.	N	P	1	W ²
Ransom Creek	104th St.	3 mi.	M	P	3	W ²
Centerline Drain	Pumping Sta.	1.9 mi.	M	P	3	W ²
W. Branch Drain	junc. Centerline	1.8 mi.	M	I	0	W ²
Veenboer Drain	Thornapple Ave.	2.5 mi.	M	P	1	

Note: N = Natural
M = Manmade
P = Perennial
I = Intermittant

C = Coldwater
W¹ = 1st Class warmwater
W² = 2nd Class warmwater

*Locations shown on
Project Maps -
Appendix B

TABLE 13 - BENTHIC FAUNA OF THE ROGUE RIVER WATERSHED

Organism	Tolerance Level	Station Number														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Chironomidae (Midge)	L	x	x	x	x	x	x	x	x	x			x	x	x	x
Hirudinea (Leech)	L				x	x				x		x			x	
Nematoda (Threadworm)	L	x	x			x	x	x	x	x	x	x				
Planorbidae (Orb Snail)	L	x	x	x	x		x		x	x						
Physidae (Pouch Snail)	L	x	x	x	x		x	x	x			x		x	x	x
Bulimidae (Pond Snail)	L	x	x	x		x	x		x		x	x	x	x	x	
Lancidae (Limpet)	M	x						x	x							
Sphaeriidae (Fingernail Clam)	M	x	x	x	x	x	x	x		x	x	x	x	x		x
Decapoda (Crayfish)	M				x			x	x			x	x			
Planariidae (Flatworm)	M				x								x			
Elmidae (Beetle)	M				x	x	x	x		x	x	x	x		x	
Isopoda (Sow Bug)	M				x											
Talitridae (Scud)	M					x		x					x	x	x	
Simuliidae (Blackfly)	M					x										
Tipulidae (Crane Fly)	M					x							x		x	
Hydriscidae (Beetle)	M							x		x						
Corixidae (Water Boatman)	M								x	x	x					
Psephenidae (Water Penny)	M								x				x		x	
Hdropsychidae (Caddis Fly)	II	x				x			x	x			x	x	x	x
Rhyacophilidae (Caddis Fly)	II					x		x					x			
Phryganeidae (Caddis Fly)	II															x
Trichoptera (Mayfly)	II				x	x		x		x	x		x	x		
Ephemeroidea (Mayfly)	II						x	x	x		x					
Heptageniidae (Mayfly)	II							x								x
Perlidae (Stonefly)	II												x		x	x

L = Tolerant

M = Intermediate

II = Intolerant

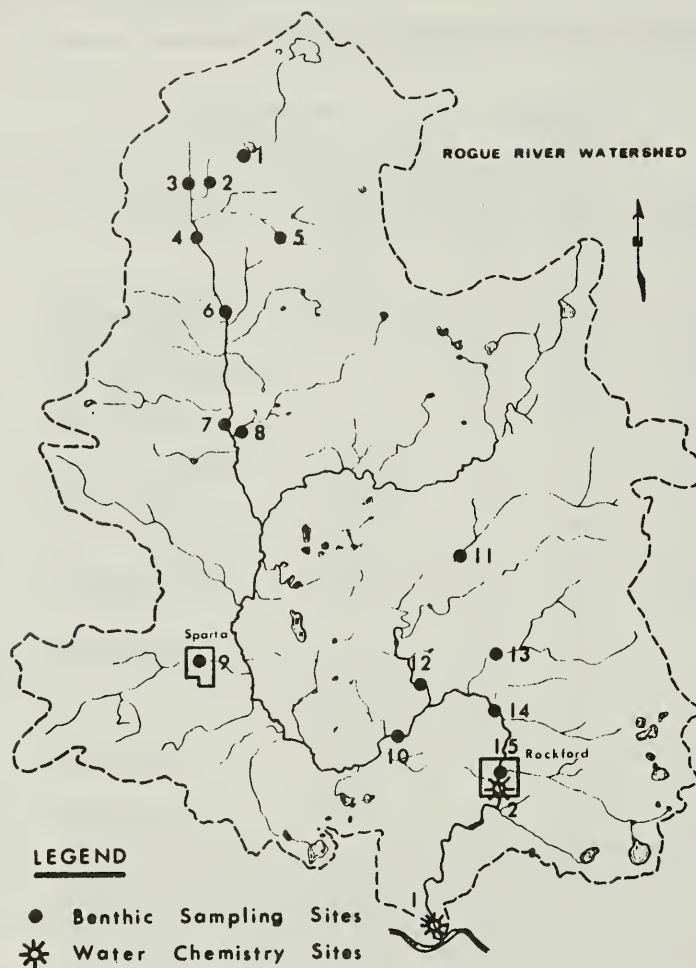


FIGURE 16 - BENTHOS SAMPLING STATION LOCATIONS

The placement of these organisms into tolerance classes (i.e. tolerant, intermediate and intolerant) is a generalization. Certain organisms may be generally tolerant, but display intolerance to certain pollutants. For example, fingernail clams are relatively tolerant to most pollutants, but quite sensitive to heavy metals.

The absence of certain larvae in some of the samples may only indicate an earlier hatch into the aerial adult forms. An earlier hatch in these areas could be a result of warmer water which would speed growth and development of the aquatic larvae.

Stegeman Creek, Cedar Creek, and Duke Creek appear to have relatively high habitat diversities and water quality, although these qualities were somewhat diminished at the upstream sampling site on Cedar Creek, just downstream from the town of Cedar Springs (station 11). Nash Creek (station 9) had a benthic community indicative of intermediate water quality conditions. None of the samples indicated a water quality condition hazardous to public health. In addition to the streams listed in Table 6, there exist 11 unnamed streams of lesser consequence in the Rogue River watershed.

Extensive water chemistry data for two stations located at the downstream end of the Rogue River was obtained from the Michigan Department of Natural Resources and is shown in Table 15. Samples were taken at station 1 between August and October 1971 and at station 2 between September and June 1973. The results appear to indicate that water quality is good, but there is a slight contamination from municipal sewage.

Dissolved oxygen in the samples was about 70% of saturation, and this correlated with the low BOD value obtained. This indicates the absence of large quantities of organic waste. The pH was rather high, but within acceptable limits. Buffering capacity is adequate, as indicated by the alkalinity values. Sulfate contents were normal. Turbidity, coliform counts, and chloride values were low, indicating clear water and only slight to moderate contamination by municipal sewage.

An interesting phenomenon was the occurrence of quantities of heavy metals. This normally is indicative of plating plant waste, however, no metal plating plants are known to exist in the Rogue River Watershed.

WETLANDS

There are approximately 232 typed wetlands found in the Rogue River Watershed. Wetland acreage is scattered throughout the watershed

and ranges in size from 0.5 to more than 100 acres. In order to determine the wetland types according to the U. S. Department of the Interior, Circular 39, "Wetlands of the United States," 30 wetlands selected at random were examined in detail. The 30 wetlands surveyed totaled 867 acres or about 14 percent of the total wetland area in the watershed.

An extrapolation of this data indicates that type 5 wetlands make up the greatest majority of the total with 5,704 acres (Table 14). Two wetlands in existence in 1962 had been drained and a third had been impounded to form a large lake surrounded by a housing development. The two drained wetlands, totalling about 1.5 acres were drained to allow agricultural use.

TABLE 14 - WETLAND ACREAGES

<u>Type</u>	<u>Description</u>	<u>Estimated Total Acreage</u>
1	Seasonally Flooded Basins	6
3	Shallow Fresh Marsh	25
4	Deep Fresh Marsh	60
5	Open Fresh Water	5,704
6	Shrub Swamp	290
7	Wooded Swamps	<u>4</u>
Total		6,089

TABLE 15 - WATER CHEMISTRY OF THE LOWER ROGUE RIVER

Parameter (mg/l)	Station Number	
	<u>1</u>	<u>2</u>
Water temperature ($^{\circ}\text{C}$)	15.5	2.0 - 20.0
Dissolved oxygen	7.4	7.0
BOD (5 day)	0.8	---
pH	8.20	8.00 - 8.30
Conductivity (micromho)	450	400 - 490
Phosphorus ortho	0.040	0.020 - 0.090
total	0.080	0.040 - 0.090
Nitrogen nitrate	0.400	0.200 - 0.790
ammonia	0.040	0.010 - 0.060
organic	0.500	0.300 - 0.570
Alkalinity, total	160	170 - 185
Hardness	230	230 - 250
Chloride	20	18 - 21
Turbidity (JTU)	6.0	4.0
Silica, total	8.8	4.5 - 9.9
Calcium, dissolved	58.0	59.8 - 70.0
Magnesium, dissolved	21.0	10.0 - 20.0
Sodium, dissolved	11.0	8.0 - 9.8
Potassium, dissolved	1.7	0.8 - 1.3
Iron, dissolved	0.090	0.042 - 0.043
Sulfate, total	70	41 - 65
Fluoride, dissolved	0.26	0.16 - 0.30
Manganese, dissolved	---	0.005 - 0.040
Phenols, total	0.000	0.000 - 0.002
Chromium, dissolved	0.000	0.000 - 0.010
Nickel, dissolved	0.000	0.000 - 0.005
Cyanide, total	0.000	0.000 - 0.020
Copper, dissolved	0.100	0.000 - 0.004
Zinc, dissolved	0.025	0.005 - 0.012
Cadmium, dissolved	0.012	0.000 - 0.001
Lead, dissolved	0.000	0.000 - 0.010
Arsenic, dissolved	0.000	0.000 - 0.005
Mercury, total	0.000	0.000 - 0.002
Selenium, dissolved	---	0.001 - 0.005
Silver, dissolved	0.000	0.000 - 0.005
Coliform Total/100 ML	1300	700 - 34000
Fecal/100 ML	50	10 - 600
Stream flow (CFS)	109	---
Color (CO units)	---	15 - 40

PRESENT AND PROJECTED POPULATION

Population densities in the two major counties in the watershed average 479.6 persons per square mile in Kent, and 33.0 persons per square mile in Newaygo County according to data in the 1970 edition of "Michigan Statistical Abstracts." Racial makeup of these two counties is predominately white, being 93.9 percent in Kent County, and 97.5 percent in Newaygo County. The balance of the population in Kent County is 5.6 percent Negro, 0.3 percent Indian and 0.2 percent "other" while Newaygo County has 2 percent Negro, 0.1 percent Indian, and 0.4 percent "other."

Governmental population projections as listed in OBERS for the statistical subareas which include the Rogue River Watershed indicate that population figures will double from 1970 to 2020 (Table 16).

TABLE 16 - PAST AND PROJECTED POPULATION FIGURES

<u>Area</u>	<u>1968</u>	<u>1970</u>	<u>1980</u>	<u>2000</u>	<u>2020</u>
405-S.E.					
Lake Mich.	2,477,400	2,529,100	2,987,600	4,069,700	5,451,300
406-N.E.	455,000	461,900	528,200	679,500	873,100

Note: Projections by Water Resource Region and Subarea.
Kent County is in area 405, Newaygo in 406.

ECONOMIC RESOURCES

Two large tracts of public lands within the watershed are managed for forestry, public recreational, and conservation uses. They are the Rogue River State Game Area (about 5,600 acres) managed by the Michigan

Department of Natural Resources, and a portion of the Manistee National Forest (about 600 acres). Both of these areas are extensively forested. In the entire Kent County area there are 26 county operated parks totalling about 3,000 acres and ranging from one acre to 500 acres in size. The rest of the watershed is in private ownership.

The character of the watershed is generally rural and agricultural. Though there is rural residential growth near communities in the southern portion of the watershed, 40 percent (67,300 acres) of the watershed's total area and 93 percent (3,380 acres) of the problem area are now used as croplands or pastures. There are an estimated 410 farms in the watershed and 40 in the problem area. These figures represent a decrease in farm numbers of about 20 percent from 1964 levels, compared to a 17 percent decrease for the state. Nearly all watershed and problem area farms are family owned, with some well into their second generation. A few have recently incorporated but remain family operated. Farm size averages 170 acres.

Estimates derived from 1969 Michigan Agricultural Census data indicate that in the watershed area about 5 percent of the farms are tenant-operated, 75 percent are owner-operated and 20 percent are operated by part-owners. Average farm size is estimated to be 140 acres. More than 50 percent of the farms in the watershed are in census economic classes 1-5 and have sales over \$2,500 per year (Table 17).

TABLE 17 - PERCENT OF FARMS BY ECONOMIC CLASS IN ROGUE RIVER WATERSHED

<u>Economic Class</u>	<u>Sales</u>	<u>Percent of Farms</u>	
		Kent Co.	Newaygo Co.
Class 1	\$40,000 and over	7.8	4.5
Class 2	\$20,000 to \$39,999	10.8	9.8
Class 3	\$10,000 to \$19,999	11.4	12.2
Class 4	\$ 5,000 to \$ 9,999	11.4	12.0
Class 5	\$ 2,500 to \$ 4,999	15.6	12.6
Class 6	\$ 50 to \$ 2,499	3.7	5.5
Part Time	\$ 50 to \$ 2,499	29.5	34.0
	(Operator under 65)		
Part Retirement	\$ 50 to \$ 2,499	9.7	9.3
	(Operator over 65)		

Source: "Michigan Agricultural Census - 1969"

According to information given in the "1969 Michigan Agricultural Census" and Michigan State University's "County and Regional Facts," average market value of all agricultural products sold was \$13,100 per farm in Kent County and \$12,000 in Newaygo County, compared with a \$10,600 average for the state. Forty-seven percent of all farm operators in Kent County reported working at least one day off the farm with 34 percent of all farm operators working off-farm over 100 days. In Newaygo, 49 percent of all farm operators reported working off-farm with 34 percent of all operators working off-farm over 100 days. Comparable percentages for the State of Michigan are 52 percent and 38 percent, respectively.

Relative ranking of the value of agricultural products (from most to least) is dairy products, livestock (mostly beef feeding), fruit orchards, vegetables for truck farms, specialized muck crops, feed grains and pastures, nursery products, and commercial forest products.



Nearly all farms, whether commercial or part time, base their operations on a specialty product or activity. In order of their decreasing shares of watershed acres, these activities are: feed grains and pastures, fruit orchards, vegetables for truck farms, specialized muck crops, livestock (mainly beef feeding), commercial forest products, dairying and nursery products. Because of specialization and intensive management, average crop yields are usually higher than those for the state:

TABLE 18 - CURRENT AVERAGE CROP YIELDS FOR THE WATERSHED AND STATE

<u>Crop</u>	<u>Watershed (Yield/Acre)</u>	<u>State (Yield/Acre)</u>
For Mineral Soils:		
Corn for Grain	75 bu.	68 bu.
Corn for Silage	12 ton	11 ton
Soybeans	26 bu.	23 bu.
For Organic Soils:		
Carrots (fresh)	240 cwt.	231 cwt.
Celery (fresh)	390 cwt.	386 cwt.
Onions (fresh)	320 cwt.	305 cwt.
Spearmint Oil	35 lbs.	32 lbs.

There is an excellent market for hardwood sawlogs with about 10 sawmills procuring timber from within the watershed. There seems to be a hardwood shortage in the general area and common sales of good quality hardwoods have sold for \$110 per thousand board feet. Pulpwood is also sold, mostly for local market.

Current agricultural land values range from near \$200/acre for sandy blowout areas, to \$400/acre for cleared, tilled and well-drained upland, to over \$1,000 per acre in the best problem area mucks. Muck land values have nearly paralleled agricultural land values rather than

residential and recreational lands indicating that the area is expected to stay in agriculture. Current muck values are about \$1,000 per acre depending on the proportion of marl in the soil and condition of the drainage system. (Beyond a point, more marl in the soil mix is believed to reduce yields of crops now grown and therefore reduces land prices. Tile systems known to need replacement or outlet improvement also reduce land prices. Fifty percent of the land is now tiled and has adequate outlet and access.)

Market access from the watershed is good. The communities of Fremont and Grant are within a 20 mile radius of the problem area and are the primary local market centers and transportation nodes for farm produce. Nearby cities of Grand Rapids, Muskegon and Holland are within a 60 mile radius of the problem area and are the larger, market counterparts of Fremont and Grant. Each of these communities contains processing or distributing facilities including those for locally grown farm products.

A well-developed system of paved county roads also gives farmers and processors year-round access to one another and to major trunklines. Michigan Highways 37, 44, 46, and 57 cross the watershed and provide access to U. S. Highways I-96 and 131 in Kent County. (See Figure 17.) The Chesapeake and Ohio Railroad Systems runs north and south through the watershed from White Cloud to Grand Rapids. The Penn Central system also runs north and south through the watershed, with the Grand Trunk Railroad being a major east-west trunkline just south of the watershed.

Kent County has a total of 100,825 families, with mean family income being \$11,996 (Table 19). About 7 percent of these families fall below the poverty level (defined by census) with a mean income of \$1,944. Newaygo County has a total of 7,023 families, with 12 percent of these families falling below the poverty level. The mean income of these families is \$2,025.

Kent and Newaygo Counties have similar distributions of workers among work activities. Manufacturing is the largest employer in both counties, employing about 28 percent of all workers. Continuing in decreasing order are trades; professional services; financial/business related services and construction; and finally, combined agriculture, forestry and fisheries. Agriculture in comparison employs only 1 percent of labor in Kent County and 9 percent in Newaygo County.

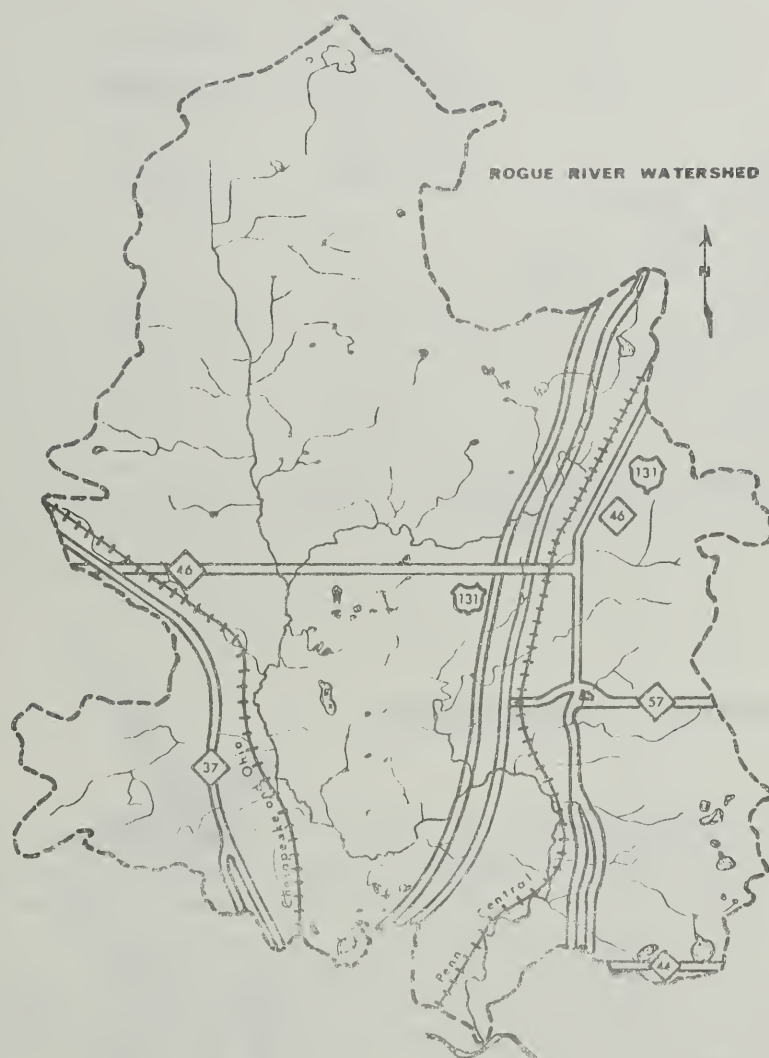


FIGURE 17 - MAJOR TRANSPORTATION ROUTES

TABLE 19 - ECONOMIC DATA ON FAMILIES

	<u>Kent County</u>	<u>Newaygo County</u>	<u>State of Michigan</u>
No. of Families	100,850	7,025	2,190,300
Mean Family Income	12,000	9,300	12,300
Percent of Families Below Poverty Income Level	6.6	11.9	7.3
Percent of Families Receiving:			
Public Assistance	4.0	4.0	4.3
Social Security Income	17.9	23.5	18.6
Percent of Civilian Labor Force Unemployed	5.8	8.5	5.8

Source: "1970 Census of Population - General Social and
Economic Characteristics"

PLANT AND ANIMAL RESOURCES

Major plant communities in the watershed can be placed into three categories: lowland hardwoods, upland hardwoods, and various disclimax communities maintained by man. (A disclimax community is an apparent climax where the climax species have been replaced by others as a result of disturbance.) The dominants in the prominent lowland hardwood climax community in the watershed are elm, ash and cottonwood except on water-logged sites, where dense stands of northern white cedar probably represent the climax community.

Sub-climax communities include birch-aspen and, near streams and in very wet areas, tag alder. (A sub-climax community is a long-persisting successional stage preceding climax.)

There are two major upland hardwood climax communities present: on wetter sites the dominants are beech, basswood and maple, while on the drier sites, oak and hickory are the dominants. (Note: a dominant is a species that controls and characterizes the community.) The sub-climax forest community for these upland sites consists almost entirely of birch and aspen.

Various species of dogwoods make up a noticeable portion of the understory in lowland sites, while bracken ferns are the most abundant understory plant in many of the upland communities in the watershed. Disclimax communities in the watershed are maintained at the expense of man and include various monocultural croplands, bluegrass pasture, and monocultural pine plantations. (Note: monocultural refers to a community consisting completely or primarily of one species.)

Aquatic plant communities are also present in the numerous lakes in the watershed. Common plants in these communities would include various cattails and rushes among the emergents, the yellow pond lilly and white water lilly among the floating group, and chara or 'skunkweed' among the demersals. (Note: an emergent is a plant having most of its vegetative structures, including leaves, stems and fruiting bodies above the surface of the water, although the roots and portions of the stems are submerged; a floating plant is one with floating leaves, but with submerged stems and roots and aerial fruiting bodies; a demersal plant is one which, except for the floating body, is entirely submerged, and need not be rooted to the bottom.)



An interesting phenomenon in this watershed is the presence of remnant tall-grass prairie species. Here and there throughout the watershed can be found big and little bluestem, Indian grass, switch grass, panicums, prickly-pear cactus, and other species characteristic of the tall-grass prairie communities that once made up a small but significant portion of Michigan.

The watershed provides only fair habitat for upland game and waterfowl, although good habitat for deer, grouse and woodcock exists in certain areas, particularly the Rogue River State Game Area and in the northeastern portions of the Watershed near Bill's and Ransom Lakes.

Terrestrial habitat along the river south of 128th Street can be classed as good, although the stream still has little to offer fish. From the Newaygo-Kent County line downstream to section 32, T 9 N, R 11 W, terrestrial wildlife habitat can be classed as good to excellent, particularly for ruffed grouse, woodcock and deer. Human disturbance in this area is low.

Downstream from section 32, T 9 N, R 11 W, terrestrial habitat declines in quality and can be classed only as fair, although some good habitat is available in places. Human disturbance becomes increasingly a limiting factor, particularly downstream from Rockford.

Many tributaries of the Rogue River provide some of the best wildlife habitat in the watershed. Duke Creek provides excellent wildlife habitat in its lower reaches, although only fair habitat is found in its upper three miles. Spring Creek provides excellent habitat throughout its length. Frost Creek, Post Creek, Nash Creek, Hilbrand Drain and Hickory Creek provide only fair habitat along their banks, while Ball Creek provides habitat of low quality. Cedar Creek provides good quality terrestrial habitat as does Little Cedar Creek. Stegeman Creek provides excellent wildlife habitat throughout its length.

Public access to wildlife resources in the watershed (with the exception of the State Game Area and Manistee National Forest) must be obtained by permission of the landowner.

Most streams in the watershed are designated trout waters (refer to previous list of streams in Table 12). An annotated list of those streams with known fishery values is shown in Table 20.

The instantaneous lethal temperature for brown trout (generally regarded as the most temperature tolerant of the three stream trout species in Michigan) is 81°F; a temperature of 79°F was recorded in 1971 by the Department of Natural Resources at the 17 Mile Road Bridge over the Rogue River, 5 miles south of the Newaygo County Line in Kent County. Table 21 indicates that the Rogue River in Newaygo County is of marginal quality for intolerant fish of cold-water species such as trout.

TABLE 20 - KNOWN FISHERY VALUES OF MAJOR TRIBUTARIES

Hickory Creek	- second quality warmwater tributary which is relatively brush covered and has a sandy bottom. Agricultural ditching in the upper reaches of this stream has degraded the quality considerably.
Hilbrand Drain	- second quality warmwater tributary.
Spring Creek	- second quality cold water stream which has a sandy and peaty bottom. Michigan Department of Natural Resources stream improvement plans include creating a siphon outlet from Spring Lake to the Rogue River and upper reaches of the Rogue River. Spring Creek above 20 Mile Road has an excellent population of brook trout and below Spring Lake has a population of brown trout which sustain themselves through natural reproduction. Agricultural practices, including allowing cattle in the streams and cultivation to the edge of the stream, degrade quality. Elimination of these practices would further improve its quality.
Ball Creek	- second quality warmwater tributary which has been degraded by drainage and cultivation to the stream-bank.
Nash Creek	- second quality warmwater tributary.
Cedar Creek	- top quality trout tributary containing brook and brown trout which sustain themselves through natural reproduction. Agricultural practices in the headwaters from Cedar Springs upstream degrade the quality of the stream considerably.
Little Cedar Creek	- top quality cold water tributary.
Stegeman Creek	- first quality cold water tributary containing brown trout and brook trout which sustain themselves through natural reproduction.
White Creek	- warmwater tributary which has a high silt load.
Walter Creek	- warmwater tributary.
Freska Lake Outlet	- second quality warmwater tributary.
Bella Vista Lake Outlet	- (also known as Barclay Creek), first quality cold water tributary containing brook trout which sustain themselves through natural reproduction.

TABLE 21 - WATER TEMPERATURES AND DISCHARGES

<u>Date</u>	<u>Location</u>	<u>Temperature</u>	<u>Discharge</u>
6/12/73	Ransom Lake Outlet	77°F	4 cfs
	Below present pumping sta.	75°F	*
	Danials Creek Drain at		
	Oak Road	74°F	15 cfs
	Hickory Creek	73°F	*
	Hilbrand Drain	66°F	*
7/10/73	Ransom Lake Outlet	78°F	2.2 cfs
	Below present pumping sta.	79°F	*
	Centerline Drain at pumps	76°F	*
	Danials Creek Drain at		
	Oak Avenue	75°F	7.5 cfs
	Rogue at 120th Street	78°F	26 cfs
	Rogue at 128th Street	76°F	*

*Flows not measured

The precise effects of air pollution on fish and wildlife resources in the watershed is not known at this time, but it is not considered a significant threat. Likewise, the effects of water pollution on the fish and wildlife resource is not completely known, but information received from the Michigan Department of Natural Resources (MDNR) indicates that no industrial discharges occur, although three discharges of municipal waste occur along the river's course: Casnovia (Ball Creek tributary), Kent City (Ball Creek tributary), and Sparta (Nash Creek tributary). Sparta's discharge receives secondary treatment and phosphorus removal; Kent City has a semi-annual lagoon system discharge; and Casnovia is in the process of constructing a lagoon system. No detailed information is available concerning the extent of agricultural chemicals and nutrients entering the river. The types of benthic organisms found at the various sample sites on the Rogue River and various tributaries indicate the existence of good water quality in the watershed.



No quantitative information on population sizes or the extent of utilization of important game or other wildlife species is available, although there is considerable hunter-use made of the State Game Area. The streams and lakes in the watershed receive considerable fishing pressure.

According to the 1974 list entitled "Extirpated, Endangered, and Rare Fish and Wildlife in Michigan" put out by the Department of Fisheries and Wildlife at Michigan State University, there are several rare and endangered species which could be in the area of the watershed. However, reasonable but unsuccessful efforts were made to determine if any were actually in the watershed and state officials do not have any indication that the species have been seen or exist in the project area.

RECREATIONAL RESOURCES

Recreational resources within the watershed are limited. Three public camping facilities are located in the watershed, providing between 205 and 450 campsites. A private campground is presently under construction on the banks of Duke Creek. Public stream fishing and boating in the watershed is available at points of access on Hickory Creek, the Rogue River and tributaries in the Rogue River State Game Area, five parcels totaling 225 acres on the Rogue River and Stegeman Creek, and in navigable streams from entry points at bridge crossings.

Public water-based recreation is available at 17 of the 232 lakes and ponds in the watershed, only 3 of which are over 100 surface acres in size. Hunting opportunities and other forms of recreation are available on approximately 5,600 acres in the State Game Area and approximately 2,000 acres of the Manistee National Forest at the extreme northern edge of the watershed. No motor vehicles are allowed in the Game Area except on designated roads. Other recreation lands in the vicinity of the watershed consist of five picnic areas and one roadside park maintained by the State of Michigan, all in Kent County and 26 parks totaling about 3,000 acres and ranging in size from 1 acre to 500 acres, operated by the county of Kent.

"An Appraisal of Potentials for Outdoor Recreational Development" prepared by Kent and Newaygo County, State and Federal personnel in 1969, indicates there is a high potential for the establishment of camping areas, picnic areas, golf courses, warmwater fishing, hunting, riding and shooting areas, and vacation farms.

ARCHEOLOGICAL, HISTORICAL, AND UNIQUE SCENIC RESOURCES

A literature search, consultation with state officials and field investigations reveal that there are archeological and historical sites within that part of the watershed affected by the project. However, no sites are within the limits of the proposed construction areas.

According to the State Historic Preservation Office and information on file with the Michigan Department of State, Division of Michigan History, there are eight possible archeological sites present. These include four campsites, one possible campsite, one Indian mound, one possible mound, and an Indian Village. The "Archeological Atlas of Michigan" by W. B. Hinsdale shows an Indian trail running north and south through the watershed from just north of Croton Dam south to the east side of Bill's Lake and ending north of Spring Creek. Hinsdale believes the existence of several prairies in central Newaygo County was the key reason for the relatively high density of prehistoric Indian sites in the area.

There are several historic sites within the watershed including the "Little Red Schoolhouse" at 389 E. Division Street in Rockford. This school was built in 1860 and is preserved as a symbol of the free educational system of the United States. It is listed as historical site No. 64 in the "Michigan History Division-Register of Historic Sites." There are no sites listed in the "National Register of Historic Places." A total of 32 centennial farms lie within the watershed as identified in the 1972 Michigan Centennial Farms Directory, Michigan Department of State. None of these farms however will be affected by any project works.

Other places of historic and scenic interest include the remains of the original sawmill built on the river just north of Rogue River Drive, and the Penn Central railroad bridge crossing Stegeman Creek.

SOIL, WATER, AND PLANT MANAGEMENT STATUS

From 1964 to 1969 the acres of land in farms in the watershed decreased from about 59,800 acres to 57,000 acres, or 4.6 percent. This is a decrease from 38.4 percent to 36.6 percent of the total land area, and compares to a state decrease from 36.5 to 31.9 percent. Total cropland decreased by 9.2 percent, and cropland harvested decreased by 14.0 percent during the same period.

Forest land use is slowly changing from timber production to wildlife and recreation. Urbanization has begun around Kent City, Sparta, Rockford, Cedar Springs, and Bill's Lake. However, the agricultural orientation of this area is expected to continue for the next few years. Some of this upland agricultural land is now idle and reverting to brush and young forest land.

County soil conservation districts conduct information programs on the benefits of proper land treatment, then encourage landowners and operators to maintain land treatment measures for the protection and improvement of the watershed. This includes measures for improving general land use and for controlling excess water. Certain programs also offer technical and financial help.

According to Soil Conservation Service representatives in Kent and Newaygo Counties, about 30 percent of the total watershed (or 47,200 acres) is now under cooperative agreements with county Soil Conservation Districts. Kent County has 343 cooperators on 38,800 acres with 319 basic farm conservation plans covering 36,500 acres. Newaygo County has 63 cooperators on 8,300 acres with 40 farm plans over 5,700 acres. Conservation measures applied to date are listed in Table 22.

Estimates from Soil Conservation District officials indicate that 46 percent (71,000 acres) of the watershed is now considered to be adequately treated. Additional acres are partially--though inadequately--treated, however, no acreage figures are available. The remaining acres still need some degree of treatment. The land category having the greatest treatment need is "other land" (followed by "land not in farms" and "farm land") because of development activities.

The average hydrologic condition of forest land is adequate and its potential to show improvement is medium to high. Forty percent of the forest land is adequately protected while the remainder needs some kind of land treatment measures applied to prevent the soil, water, and plant resource from deteriorating and thus protect and improve these resources.

Under existing cooperative forestry programs during the past ten years, all forest land is adequately protected against fire. During this period 500 acres of tree planting, 400 acres of timber stand improvement, 450 acres of harvest cutting, and eight management plans covering 150 acres were accomplished. On national forest land 125 acres of harvest cutting and 65 acres of tree planting were accomplished. Forest fire protection is provided by the Michigan Department of Natural Resources in cooperation with the U. S. Forest Service under the Clarke-McNary Cooperative Forest Fire Control Program and on national forest land by personnel of the Huron-Manistee National Forest.

Other current federal-state cooperative forestry programs include: Cooperative Forest Management, Cooperative Forestation, and Cooperative Forest Pest Management.

TABLE 22 - LAND TREATMENT MEASURES APPLIED IN THE WATERSHED

<u>Measure</u>	<u>Units</u>	<u>Applied To Date</u>
Conservation Cropping System	Acres	8,553
Critical Area Planting	Acres	60
Crop Residue Management	Acres	6,769
Drains	Feet	526,589
Drainage Main or Lateral	Feet	68,437
Field Windbreak	Feet	7,950
Firebreaks	Feet	1,000
Fishpond Management	No.	5
Fire Control	Acres	50,700
Forest Management Plans	Number/Acres	8/150
Grade Stabilization Structure	No.	13
Grassed Waterway or Outlet	Acres	50
Land Smoothing	Acres	253
Minimum Tillage	Acres	3,351
Pasture and Hayland Management	Acres	496
Pasture and Hayland Planting	Acres	791
Ponds	No.	49
Stripcropping	Acres	309
Timber Stand Improvement	Acres	3,900
Tree Planting	Acres	565
Wildlife Upland Habitat Management	Acres	1,216
Wildlife Wetland Habitat Management	Acres	280
Woodland Improved Harvesting	Acres	675

PROJECTS OF OTHER AGENCIES

There are no planned or on-going projects in this watershed, which will be adversely influenced or affected by this project.

WATER AND RELATED LAND RESOURCES PROBLEMS

Several different but interrelated environmental problems occur in the Rogue River Watershed. Flooding and inadequate drainage, the most significant and damaging watershed problems, occur in the problem area. Erosion is the most widespread and growing watershed problem and occurs mainly as sheet erosion, streambank erosion and wind erosion. Newaygo County has the most serious erosion sources while Kent County--mainly due to its larger water contributing area--has less serious erosion problems over nearly all of its area. Sediments produced from this erosion increase turbidity, decrease channel capacity and tend to flocculate chemicals and pollutants. General water quality is otherwise good. Fishery and wildlife problems include stream sedimentation, forest overcutting, excessive stream temperatures and the destruction of wetland areas. Availability of developed public water-based recreation is limited in spite of an abundant surface water supply. Human habitat problems show a minimal understanding of man's risks in developing land for his use. And finally, economic problems center around the loss of income by growers due to increased yields and poor crop quality, and losses to the Grant area economy due to their heavy reliance on income from local produce.

LAND AND WATER MANAGEMENT

Land management problems are mainly functions of soil type, drainage or land use in this watershed. Though one of these variables often seems primary in any given area, all three are usually involved together.

Several areas of severe wind and water erosion, for example, have developed in sensitive sandy soils and will cause increasingly more land voiding and channel filling unless stabilized. One such area is along 3.75 miles of the Rogue River in Sections 23, 26 and 35 of T 11 N, R 12 W, where unstable, light-sandy spoil banks are wind-eroding and being deposited in the river. Existing grasses do not provide sufficient cover or root anchorage to protect these areas.

Another area of unstable conditions is along 1.7 miles of the Danials Creek Drain and its tributaries in Section 24 of T 11 N, R 12 W, and in Sections 19 and 30 of T 11 N, R 11 W (Figure 18). The problem described above is repeated here and is even more serious since channel banks have been denuded and steeply sloped by private dredging. This area is the source of most of the sediment now being deposited in (and dredged out of) downstream reaches.

Forty-seven acres of sand blowouts have occurred in Section 35 of T 11 N, R 12 W. This area contains two depressions of light, dry sands which lie on both sides of the Rogue River and contribute sediment to the stream. This area is denuded and has also been overgrazed by cattle.



FIGURE 18 - Area Needing Streambank Protection
on a Danials Creek Drain Tributary.

The fourth area of severe wind erosion problems is the 250-acre central part of the Rice Lake muck (Sections 13, 14 and 15 of T 11 N, R 12 W) where four miles of channel are being filled in by sedimentation

and a small amount of wind erosion. This area is largely open and unprotected from prevailing westerly winds which move the light topsoil particles that are being deposited in North-South channels.

The entire problem area, and other isolated watershed areas where light soils are tilled, need strict water table control to limit both wind and water erosion. A high water table restricts proper growth of certain specialty crops and hinders proper tilling and ground covering needed to shelter the soil from winds. A low water table induces chemical break-down of the soil by oxidation and subsidence, and also frees the fertile, topmost soil layers to wind erosion. Land treatments alone cannot eliminate these losses, but when combined with adequate drainage, streambank protection and water table controls, losses can be greatly reduced.

Indications are that the present acreage of forest land is needed now and in the future for watershed protection, timber products, recreation, fish and wildlife habitat, urban environmental quality, aesthetics, or combinations thereof. Forest management efforts and land treatment measures must be intensified to derive the optimum mix of, and satisfy the increasing demand for goods and services from these forest lands. Prescribed management is needed with small ownerships organized to work together to make commercial thinning and logging pay off.

Comprehensive contracts with meaningful logging specifications are needed between buyers and sellers. Black walnut management should be encouraged and reforestation of preferred hardwoods in unmanaged cut over areas is needed. The allowable cut for good hardwoods is being exceeded which tends to add to the hardwood sawlog shortage generally throughout southern Lower Michigan. Forest land insect and disease control and advice is in high demand in most urban-developed areas.

In some developing areas of Kent County, many soil types and slopes are being used for purposes that are outside their proven limits and capabilities. Valuable agricultural land is being lost to other types of development, and irreplaceable wetlands are being destroyed by both drainage and development. Prophetically, competition among land uses is expected to increase.

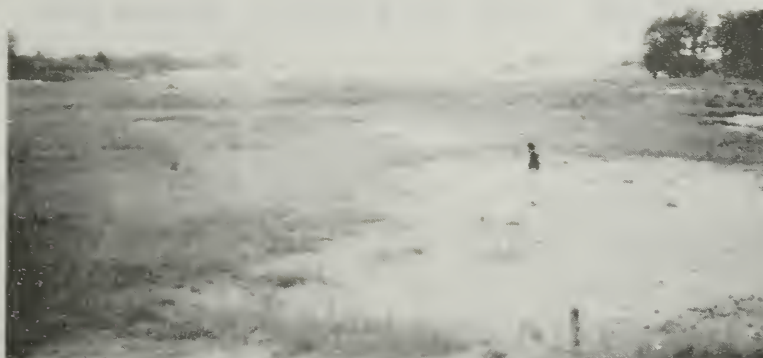


FIGURE 19 - Sand Blowout Requiring Critical Area Stabilization Measures.

Knowledge of flood hazards is not widespread. Yet much of the Rogue River flows through scenic agricultural and forested areas which are already sought after for homesites. Encroachments into the flood plain by land filling, transportation networks, and other developments not only destroy these scenic areas, but also constrict the flow of flood water. This increases flood water depths and the extent of flooding. Planners, potential users, and occupants need more information available to them to assess risks to physical resources, wildlife, and humans.

FLOODWATER DAMAGE AND DRAINAGE PROBLEMS

Floods cause the major water and land related problems in the watershed. The most continuous and significant damages now occur in the Newaygo County problem area, while comparatively irregular but larger damage potential occurs in Kent County's Rogue River Valley (Appendix B). The Newaygo area receives damages at about one-year frequency floods so that damage risks to farmers, depending on drainage conditions and timing in the growing season, are more or less certain from year to year. The Kent area, however, begins to receive damages at 5 to 10 year frequency floods. Damage to homes and businesses have occurred infrequently if ever, but their risks depend on the type and degree of development which increases each year.

First, the problems of the Newaygo area: Since there are no towns or valleys within the area of current flooding, direct damages occur primarily to agricultural lands. Inadequate channel depth and capacity allow flooding and cause impaired drainage on some 3,660 acres of muck soils. About 3,380 acres of this is now in crop production. Agriculture is the primary land use in the problem area with the majority of the acreage in carrots and onions (Table 23). Interview data and market studies indicate this land is expected to stay in agricultural uses.

There are 40 landowners in the problem area. Farm size averages from 200 to 300 acres and ranges from plots of 20 to 600 acres. Several growers have also started their own marketing operations or have joined cooperatives.

Most damages result from relatively small flood events (450 acres inundated, up to 4 days duration, 3 inch maximum depth, and low velocities) that occur one or two times on the average, each year. Gauge readings at Rockford Dam show that about 40 percent of all floods have occurred within the April 1 to September 30 growing season. Damages occur most frequently in springtime and are caused by slowly draining flood waters on crops and crop-ready land. But as the growing season continues and more costs are spent on the crop, damage amounts increase greatly.

TABLE 23 - LAND USE IN THE PROBLEM AREA

<u>Land Use</u>	<u>Acres</u>	<u>Percent</u>
Carrots (including Parsnips)	1,790	49
Celery	105	3
Spearmint	470	13
Onions	910	25
Other crops (incl. Red Beets, Lettuce, Cabbage, Turnips)	105	3
Forest Land	-0-	-0-
Other uses (incl. Access Road, Airstrip, Channels, Windbreaks, Storage and Buildings)	280	7
Total	3,660	100



Farming throughout the problem area is quite homogeneous, as are the damages. Most of the tabulated annual damages result directly from floodwater and/or impaired drainage. Estimated average annual floodwater damages to crops and pasture is \$100 per acre to approximately 600 acres flooded annually. Farmers reported that other agricultural and non-agricultural damages due directly to floodwater existed, but that they were relatively insignificant.

Direct floodwater damage to agricultural improvements, stored crops and other private or public property is infrequent and minor. Most of these are located around the perimeter of the mucks and therefore above the usual flood contour. Recent damaging floods have

occurred in 1969, 1971 and 1972 with direct losses to the farmers, through decreased yields and poor crop quality, amounting to approximately \$793,000 in 1972 alone.

The needs of specialty crops for both water table control and irrigation water supply do not mix well with such flooding and the lack of drainage outlet. These conditions depress crop yields, increase cultivation and harvesting costs, and adversely affect the health, market grade and handling character of crops. The potential of area farms, though already comparatively high, is not fully realized.

Problem area farmers are unable to perform field operations in a timely manner due to poor drainage and the spring and fall floods. Equipment breakdowns, input levels, input unit cost and maintenance costs all increase under these conditions while crop quality and quantity decrease. But secondary effects also contribute to inefficient use of land, labor and capital and the reduction of yields. The high probability of flooding prohibits farmers from investing in proper cultural and land treatment practices. Water related susceptibility to disease and parasites in the field and in handling decrease growers alternative cropping patterns. As a result, this land is often farmed less intensively than it could be.

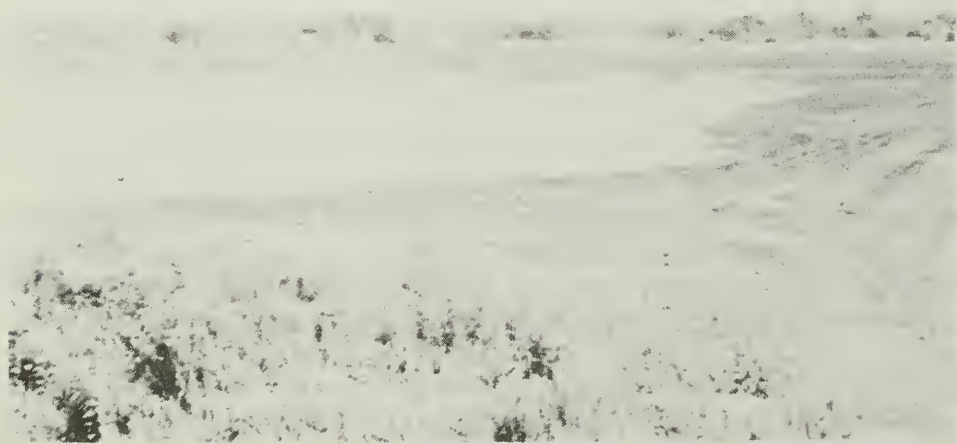


FIGURE 20 - Flooded field, Rogue River damage area; August 1972.

Inadequate channel capacity and localized inadequate channel depth allow flooding and cause impaired drainage on approximately 3,660 acres of land, (3,380 acres of this is now cropland). This occurs in the problem area which consists of organic soils that are sometimes mixed with marl. In most cases, these soils have moderate to wide crop adaptability, but seasonal high water tables severely limit cropping alternatives and yield production if not adequately drained. Without such limitations these soils are highly productive.

Without an outlet internal drainage of the muck is severely limited. Storms during the growing season cannot run off very rapidly and thus flooding occurs. This in turn raises the water table and damages the crops below the ground surface.

These conditions result in a lower quality product (or even no product); less intensive land use; reduced yields; higher production costs; and inefficient use of land, labor, and capital. It is often impossible to follow recommended crop rotations and cultural practices or to make necessary investments in land treatment measures. Individual farmers cannot establish effective on-farm drainage systems without having an adequate outlet for the drainage.

Problems of the Kent County area: The Kent County portion of the Rogue River travels slightly over 25 miles from the Kent - Newaygo county line to the watershed outlet at the Grand River (Appendix B). The first 4 mile reach is surrounded by the Rogue River State Game Area and currently has no serious flooding or drainage problems, since land use is controlled for wildlife and swampy or river flat areas adjacent to the channel can experience flood flows without damage. The remaining 21 miles to the Grand River are more entrenched and under considerable uncontrolled land use changes.

Though no damaging floods have been reported recently, preliminary hydrologic data shows that the risk of experiencing flood damage begins between the 5 to 10 year frequency events. However, as more development occurs within the flood plain, components of risk, the number and value of structures affected, and character of flood flows tends to increase.

About 250 structures now within the 100-year flood plain are affected including 200 homes, 2 sewage treatment plants, a portion of a mobile home park and some commercial and industrial enterprises. It is estimated that 90 percent of these structures are above the 25-year flood level. Flooding would be confined mostly to basements and first floor levels. This type of shallow flooding presents almost no threat to human life. The structures are distributed uniformly along the 21 miles of river from its outlet to the State Game Area.

EROSION DAMAGE

Although sheet and wind erosion are problems in the watershed, the most severe problem is streambank erosion, the result of which is deposited directly into the stream. Stream meanders, high water table, cattle and trail bikes all account for some of the erosion as does an insignificant area of roadside erosion.

Serious bank erosion is occurring at several locations throughout the watershed. Between the Kosten Drain outlet and 128th Street, several short sections of sand are actively working into the Rogue River on the outside of bends. A temporary perched water table about 3 or 4 feet above the river level is causing seepage from the east bank and is washing sands and silts out and causing bank slumping. Recent excavation to deepen the channel has increased the magnitude of this problem.

Downstream from 136th Street, some scattered sections of sand are actively eroding at the bottom of the slopes on the west side, and two sand banks each about 50 feet in length--are supplying sediment to the Rogue River. Immediately downstream from the Veenboer Drain, a section of 300 to 400 feet of bank on the east side is adding sediment to the Rogue River. Cattle trails in this area are contributing to the erosion of the sandy banks. Stream meanders between 17 and 19 Mile Roads and south of 15 Mile Road on the Rogue River have also deposited large amounts of sands into the channel over the years.

It has been estimated by local farmers that the surface of the muck has been lowered about two feet because of wind erosion, organic soil oxidation and subsidence. On the east side of the Rogue River between 22 Mile Road and the Veenboer Drain, there is a total of 0.4 acres of exposed windblown sand from which approximately 369 tons of sand have been eroded, to cover an area 0.8 acre in size. On the west side of the Rogue River, there is a total of 8 acres of exposed sand

from which about 2,467 tons have eroded. There are additional areas totaling 11.5 acres of exposed sand in the vicinity on both sides of the Rogue River.

The general effect of erosion on agricultural production is to remove plant nutrients and finer textured soils from the higher areas and deposit them in depressions. This causes a decrease in production and quality of row crops. This applies to over 15 percent of all watershed lands or 35 percent of watershed cropland according to 1967 County Conservation Needs Inventory data.

SEDIMENT DAMAGE

Sediment damage occurs in this watershed as a result of the extensive streambank and wind erosion. Overbank flow results in some silt and clay deposition on agricultural lands, but this amount is too small to adversely affect crop production.

Reservoirs, distribution systems, channels and drainage facilities are affected directly by sediment from streambank erosion by filling and reducing capacity of these facilities. Bedload movement from the Kosten Drain into the Rogue River amounts to 5.2 tons of sand in 24 hours during a 1 year storm, although no bedload movement takes place at or near base flow conditions.

RECREATION PROBLEMS

Availability of public water-based recreation is limited in the watershed in spite of an abundant surface water supply. Only 17 of the 232 lakes and ponds in the watershed have public access. Most of the land surrounding these waters is in private ownership and access is by permission only. Providing recreational opportunities for present and projected populations is the greatest recreational problem in the area since OBERS projections (Table 16) predict a regional population increase of 50 percent between 1970 and 2020. This computes to a population of nearly 1,000,000 in Kent and Newaygo Counties and--with other trends such as land use conflicts--suggests large increases in recreation demand.

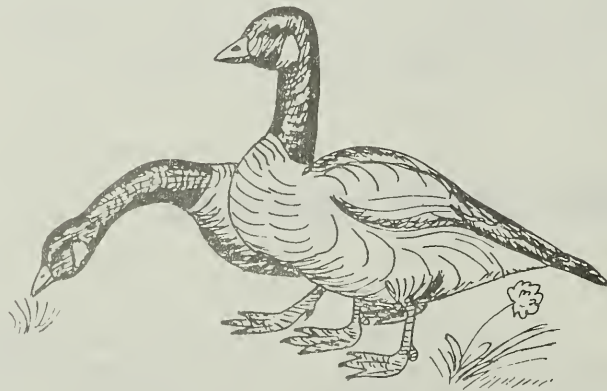
Information from the "Michigan Recreation Plan 1970" indicates there is and will continue to be a shortage of beaches and boating sites, hiking trails, camp sites and picnic areas. According to the Michigan Department of Natural Resources in their "Preliminary Natural Rivers Plan" with the projected population increases use of outdoor recreational facilities can be expected to increase almost 50 percent by the year 2000. A quote from that plan will serve to demonstrate latent recreational demand in the watershed:

"The Rogue River experienced a big increase in angler numbers following the 1968 chemical reclamation and subsequent restocking with trout. It is estimated that angler usage increased from 20 to 80 anglers per mile per year. With an improved fishery, it is estimated angler numbers will increase to between 120 and 150 anglers per mile per year."

Water quality data for the numerous lakes and streams in the watershed is not available. The only fact available concerning this is that the State of Michigan has designated all natural lakes be protected for total body contact and all public waters for partial body contact.

PLANT AND ANIMAL PROBLEMS

The major threat to wildlife and fisheries habitat in the Rogue River Watershed is suburban expansion. The current trend of urban dwellers is to move to rural areas and bring their urban values with them. Large land ownerships are broken into smaller units. Carefully manicured lawns with a greatly increased human disturbance factor take the place of brush or forested areas. This type of activity is especially evident in the southern half of the watershed.



Clean farming and intensive agricultural management (unlike other areas of Michigan) is not a problem anywhere in the watershed with the exception of the problem area. The tendency to use ryegrass strips in favor of replacing old field windbreaks does, however, slowly decrease the small amount of habitat available to wildlife. Deer use these windbreaks as travel lanes to move between forested areas and vegetable fields.

WATER QUALITY PROBLEMS

Water quality problems are being caused through the erosion and sedimentation which occurs through urbanization in the watershed. Until the numerous development sites along the Rogue and its tributaries are stabilized, construction sediments have direct access to the river. This sediment, when added to upstream sediments from wind and channel banks, causes a two-fold problem: First, it temporarily destroys the fish habitat by filling pools and clogging fish-food producing riffles, and second, it suffocates fish whenever high concentrations of sediments pass downstream---usually during high water flows. Suffocation occurs as the result of the sediment clogging the gills of the fish and is analagous to the inhalation of large quantities of dust by humans.

Another water quality problem in the Rogue River is high water temperatures. The instantaneous lethal temperature for brown trout (generally regarded as the most temperature tolerant of the three stream trout species in Michigan) is 81 degrees F; a temperature of 79 degrees F was recorded in 1971 at the 17 Mile Road Bridge over the Rogue River, 5 miles south of the Newaygo County line in Kent County. It is apparent that the cold-water classification of the Rogue River is in danger, and any projects in this watershed should be planned in a manner designed to preserve or improve the present water temperature conditions in the Rogue River.

ECONOMIC AND SOCIAL PROBLEMS

All of Newaygo's watershed area farms are family owned and operated. Many are well into their second generation of farming the Rice Lake basin. But because of the intensive labor demands of their crops and the number of operators who market their own produce, many farm operators hire over 1 1/2 man-years of non-family labor.

Farm size ranges from less than 30 acres to nearly 600 acres in the problem area, with an equal number of instances of each extreme. The smaller acreages lie mainly on the perimeters of the muck soils.

All problem area farmers produce specialty vegetable crops which are relatively sensitive to fluctuations in market, weather and soil conditions. Unlike other vegetable growing areas in the USA only one crop is produced per season, but historically high yields and consistently high market values of local products make these farms capable of producing competitively high incomes. Additional economic and agronomic requirements of these crops include unusually high investments in up-to-date, specialized capital, technical know-how, and land. Grant area farmers are known to be innovators.

Economic and social problems have resulted from damaging floods in 1969, 1971 and 1972. Compilations of 1972 flood interview data show a loss of about \$793,000 in decreased yields and crop quality to problem area farmers alone. Other damages included higher drying, storage and transport costs; increased machinery breakage; time delays; and increased labor costs in sorting culls and emergency overtime. Approximately 1800 acres of the problem area were inundated during this flood.

Grant processors also incurred losses. The nine local marketing and packing operations employ an estimated 300 local residents and migrants. Two of these are co-operatives of local farmers; one is affiliated with a national food chain. Others are operated by individual problem area farmers. Packing operators report that nearly 150 residents and migrant workers were laid off for a time during the 1972 season, a direct loss of nearly \$100,000 in wages.

Local officials related that state support for Grant schools decreased as workers were laid off their packing jobs and moved their families to other areas. This support amounted to \$712 per student in 1972 on a planned 40 potential students. Local newspapers quoted losses to the community between four and five million dollars from that 1972 flood.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

Land, water and air are basic assets to be used and managed wisely to protect, conserve, and enhance their productivity and quality for all Americans. A land-use policy is the expression of society's determination of how its resource, land, is used. A land-use policy refers to the total of all those national, state, and local laws, ordinances, and attitudes affecting the short-term or long-term uses of land, private or public, through such mechanisms as ownership, inheritance, taxation, condemnation, zoning, redevelopment, building regulation, master planning and legislative fiat. The major responsibility for land-use policy (including planning and regulation) rests with local and state governments.

Michigan has no one state land-use law. Numerous laws already on record contain provisions for regulating certain types of lands. There is nothing which ties these laws together nor is the enforcement vested with any one department. Many people feel, however, that there is a need for the state to take the leadership in this field and establish a policy.

While there is no local master plan for the area, the proposed action conforms to current desires to help enhance and preserve prime agricultural, forest, and waterfowl habitat lands.

Both Kent County and the State of Michigan are carrying out land use studies in the Rogue River Area. Kent County Planning Commission sponsored a comprehensive sewer and water plan in 1972 as one base for future planning action. Michigan's Department of Natural Resources has proposed designating the area as a Country Scenic River and establishing portions as a Natural River Zone. Newaygo County has had a sewer and water plan since 1970 and has had a comprehensive county master plan since 1973. This project is not expected to adversely affect or be affected by any of these actions.

THE HISTORY OF THE
CITY OF BOSTON
FROM 1630 TO 1800



ENVIRONMENTAL IMPACT

CONSERVATION LAND TREATMENT

Measures applied in the accelerated treatment program will adequately treat an additional 10,528 watershed acres (2,140 cropland acres; 5,150 pasture land acres; 2,420 forest acres; and 181 other acres). Many additional watershed acres in all categories will be partially treated.

By applying land treatment practices, gross sheet erosion from the entire watershed will be reduced by 45 percent from 4.5 to 2.5 tons per acre per year. Sheet erosion rates from cropland will be reduced by 52 percent from 6.2 to 3.0 tons per acre per year. Sediment buildup behind the two downstream dams will be reduced 47 percent from 42,000 tons per year to 22,090 tons per year. Because of these dams, sediments leaving the watershed will be reduced only to the degree to which land treatments are applied along the tributaries below the dams. Surface water runoff will be reduced by about 1 percent. Wind erosion rates will be reduced to near-zero.

Applying forest treatment practices will have the following effects. When grazing is eliminated from forest land, erosion should be reduced from an average rate of 1.2 tons per acre per year to 0.39 tons. With management plans and prescribed forest practices, logging disturbances will return to a normal or geologic erosion rate in three to five years. By seeding logging skid trails to grass, building water bars and using other conservation procedures, the erosion average annual rate of 4.7 tons per acre can be reduced 70 percent in one year.

A stable average rate of 0.35 tons per acre per year could be attained in three to five years. If forest land management and protection were implemented, accelerated forest land erosion could be reduced from 2900 tons annually to 1030 tons annually.

Practices such as drainage mains or laterals, drainage field ditches, and tile drains will improve agricultural impact on the environment. Improved drainage will allow farmers to get crops established earlier to reduce soil losses through erosion, oxidation and subsidence; permit selection of higher yielding full season crop varieties; and to permit a more effective weed control program. Other land treatment measures such as conservation cropping systems, crop residue use, minimum tillage, and pasture and hayland planting and management will also increase agricultural production and efficiency as well as protect the land. These measures will increase net returns to land managers and make more efficient use of capital, labor, and other resources.

Leaving crop residues on fields as part of land treatment will increase fall and winter use of these areas by upland wildlife. Upland drainage practices will improve agricultural efficiency but could also facilitate removal of wooded areas for use as cropland. These losses will be partially offset by tree and shrub plantings.

With the application of animal exclusion and grass plantings in sand blowout areas, it is likely that wind erosion in these areas will be reduced to practically zero. Quality of runoff water should remain the same or improve slightly with the decrease in runoff.

The project will have no effect on vector control, health or safety of the residents, archeological or historical landmarks, the groundwater table or groundwater recharge. Aesthetics of the area will be improved since debris from flooding will not accumulate as often and the land treatment measures will provide cover and food for wildlife.

NONSTRUCTURAL MEASURES

A flood plain study in the lower part of the watershed will provide the information necessary to prevent the slow, but continuing,

flood plain encroachment. The various cities and townships along the river will pass laws to govern the use of the delineated flood plain to limited, non-critical development. Such action, when enforced, will make floodplain users aware of risks, and provide legal entities with basic information to qualify for other programs such as federally sponsored flood insurance. Nearly 250 existing structures, mostly homes, will be affected. Conservative projections show that an additional 80 homesites would be prevented from building in the flood plain, therefore prevented from receiving average annual flood damages of \$12,100 (\$10,500 primary plus \$1,600 indirect). Additionally the gradual halting of construction in the flood plain, estimated to be 4,500 acres, would limit erosion disturbance and land misuse and also preserve fish and wildlife resources.

STRUCTURAL MEASURES

With the installation of the 11.6 miles of channel work, stream-bank protection measures, and one pumping station, the average annual acres flooded will be reduced in the problem area from 600 acres to 30 acres, a 92 percent reduction over the 50-year project life.

The structural works of improvement will cause a reduction in average annual agricultural flood damages received on 3,660 acres by 40 landowners. This reduction will be from \$79,280 to \$9,305 or 88 percent. In addition, agricultural efficiency will be increased on 3,286 acres of the problem area.

Land use changes which will occur in the problem area include a decrease in agricultural land from 3,380 acres to 3,286 acres. These 94 acres are located along the channels and will be converted into grass as part of the floodway, berms and maintenance areas. This change in land use will not result in the loss of any wetland areas or bottomland hardwood areas.

Table 24 compares the discharges (volumes of water) and the stages (elevation of the water surface) for flood frequencies near 22 Mile Road, Kent-Newaygo County line.

As indicated in the table, peak discharge and stage are increased for the 1 and 2 year frequency floods with project measures. Conversely, peak discharge and stage are decreased for the 10, 25, 50 and 100

year storms. Flooding downstream from the problem area will be decreased slightly for large infrequent floods. There is no flooding downstream for the 2-year or smaller event.

Protection will be provided in the problem area so that flood waters up to a 10-year frequency will remain in channels. Table 25 compares the acres flooded with and without project for floods of various frequencies. Floods of 100-year frequency occur statistically only once in a 100 year period, those of 1-year frequency occur annually.

TABLE 24 - FLOW CONDITIONS
UPSTREAM FROM 22 - MILE ROAD

Flood Frequency	Without Project		With Project	
	Discharge CFS	Stage FT	Discharge CFS	Stage FT
100 year	1,110	783.0	900	782.7
50 year	938	782.8	750	782.3
25 year	792	782.5	640	781.7
10 year	584	781.3	490	780.7
5 year	355	779.6	345	779.5
2 year	208	778.4	228	778.5
1 year	128	777.7	150	777.9

With and without project conditions are described in part by the comparisons of land use shown in Table 26. This table shows the projected changes in type and intensity of land use expected to occur as a result of project. It is also used in measuring impacts of the project.

TABLE 25 - NEWAYGO PROBLEM AREA ACRES FLOODED

Flood Frequency	Without Project	With Project
100 year	2,100	600
50 year	1,800	470
25 year	1,500	285
10 year	1,200	-0-
5 year	930	-0-
2 year	500	-0-
1 year	-0-	-0-
Average Annual	601	30

TABLE 26 - FLOOD PLAIN LAND USE IN
THE NEWAYGO PROBLEM AREA

Land Use	Future Without Project Acres	Percent	Future With Project Acres	Percent
Carrots	1,860	49	1,841	50
Celery	100	3	131	4
Mint	440	13	197	5
Onions	980	27	1,117	31
Cropped Subtotal	3,380	92	3,286	90
Forest Land	--	--	--	--
Misc. Land Uses	280	8	374	10
TOTAL	3,660	100	3,660	100

Installation of the proposed project measures will cause a complete disturbance of wildlife habitat on berms, spoil areas, and other cleared areas for up to three years. In addition there will be a temporary disturbance of the benthos community along the 10.5 miles of channel which will be widened and deepened. The planted cool season perennial grasses on the disturbed areas will provide good food and cover for ground-nesting birds.

Construction of the channel work and the two debris basins will cause an increase in the amount of sediments in the streams during the construction period. However, a debris basin and straw baffel at the foot of project measures will be the first construction item to be installed. Once established, this basin will trap sediment and reduce turbidity from the construction of the channels. Further, the debris basin will be maintained to trap any sediment moving down the stream during the project life. Nonrenewable fossil fuel will be used during the construction period and to operate the pumping station.

The Danials Creek Drain debris basin will reduce the amount of sand reaching the Rogue River to almost zero for flows up to the 10-year frequency event (Figure 21). This will keep most of the sediment from above the problem area from reaching agricultural ditches and the proposed pumping station.

Sediment generated by the channel work in the Rogue River below the Kosten Drain will be deposited in the debris basin constructed at the downstream end of the project. Straw baffles installed at the base of the debris basins during construction will reduce undesirable turbidity produced as a result of construction. These structural measures will reduce sediment damage to fish and wildlife habitat below the problem area. Scouring and clogging of fish-food producing plant beds and gravel areas will be reduced.

With project, a total of 40 farmers who own 3,660 acres (including 3,286 acres of cropland) will receive flood prevention and improved drainage on their land. Installation of the planned channel work will reduce flooding from an annual occurrence to an average of once in 10 years. More intensive land use and improved drainage results in reduced production cost, improved crop quality, and increased production. Improved drainage will allow farmers to get into their fields earlier in the spring; will allow a more effective weed control program; will permit the selection of higher yielding, full season or otherwise appropriate crop varieties; will decrease crop vulnerability to insects and soil-borne diseases; and will help prevent delayed harvest of crops. Water level control structures will allow water table management of muck soils to control subsidence and oxidation, and prevent possible over-drainage.

Changed land use will result in the net conversion of 94 acres of cropland to non-cropland uses. Future expected crop yields with and without the project are shown in Table 27.

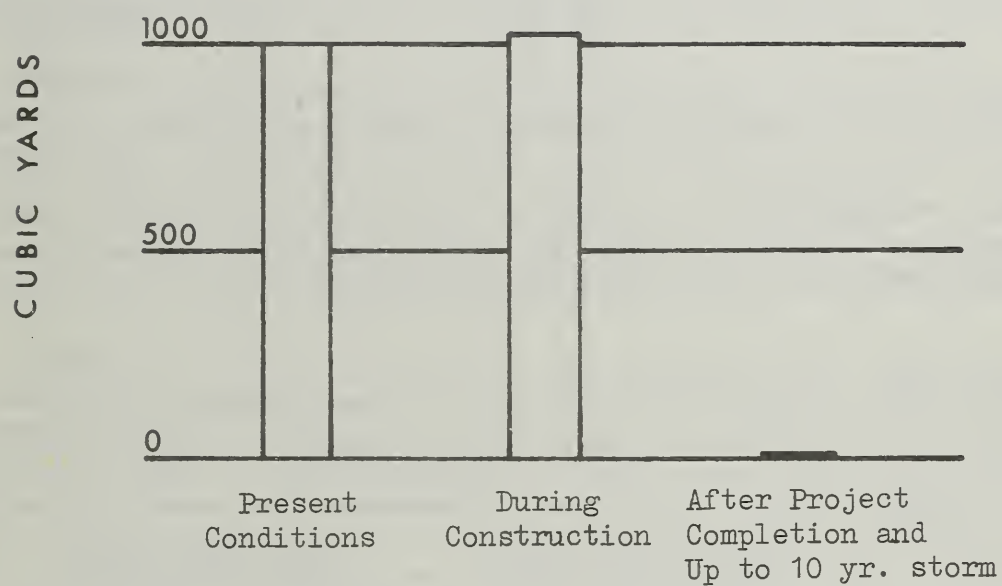


FIGURE 21 - Sediment Reaching Rogue River Yearly From Kosten Drain and Danials Creek Drain.

TABLE 27 - FUTURE CROP YIELDS PER ACRE

<u>Crop</u>	<u>Future Yield Without Project</u>	<u>Future Yield With Project</u>
Carrots	250 Cwt.	285 Cwt.
Celery	400 Cwt.	440 Cwt.
Spearmint	38 lbs.	47 lbs.
Onions	350 Cwt.	425 Cwt.

Physical changes shown in Table 28 are required to provide adequate capacity to control flooding and to prevent bank erosion of unstable sands, which has been a problem in the past.

TABLE 28 - CHANNEL CHARACTERISTICS

	<u>Bottom Width (ft.)</u>		<u>Top Width (ft.)</u>	
	<u>Present</u>	<u>Proposed</u>	<u>Present</u>	<u>Proposed</u>
Reach I	22	30	55	85
Reach II	12	22	40	61
Reach III	10	10	35	35
Reach IV	8	6	30	35
Reach V	5	4	20	30
Reach VI	8	24	30	70
Reach VII	--	20	--	60

No wetlands will be directly affected by project actions. The present project proposal will aid and abet the continued agricultural use of this area.

The reduction in estimated sediment delivery rates from 10.5 to 2.5 tons per day for a 1-year frequency flood from the problem area will undoubtedly enhance downstream fish and wildlife habitat. Fish

habitat will benefit by the reduction in sediment load by assurance that the numerous pools in the Rogue River State Game Area will not aggrade, since the bedload movement during periods of flood flows will be reduced to a level nearer that present before the forested uplands were cleared.

Proposed project measures will have no effect on water levels of any lake or pond in the watershed. A structure will be installed to prevent any lowering of the water level in Ransom Lake. There is no expected impact from the project on any future mineral production.

Water is being used and will be increasingly used for domestic, industrial, recreational and agricultural purposes. Sufficient water is available for present and future needs and is important to the economic development of the area. Water is recovered from artesian wells, shallow drift wells, deep rock wells and from the Rogue River itself. The groundwater tends to be high in iron and has some calcium chloride and sulphates in solution.

There is no forest land within the problem area. Non-farmed lands in windbreaks, access roads, channels and an airstrip are expected to increase in total acreage as a result of the project. This will decrease the number of problem area cropland acres from 3,380 acres to 3,286. Of this amount, carrots will increase about 21 acres, celery acreage will increase about 31 acres, mint will decrease 243 acres, onions will increase 137 acres. Miscellaneous crops such as red beets, lettuce, cabbage and turnips were not considered in these estimates though interviews showed that they made up 3 percent of the current composite acre.

More intensive land use will occur on 3,286 acres of cropland which are already in crop production. Fewer harvest and tillage operations will be delayed, chemicals will not be diluted, crop vulnerability to insects and soil-borne diseases will decrease, yields will increase in quantity and quality, and farm operators will be able to increase their input investments. Improved drainage will allow farmers to get into their fields earlier in the spring; will help prevent delayed harvesting of crops; will permit the selection of higher yielding full season crop varieties; and will allow a more effective weed control program.

The project will decrease the number of acres used for crop production from 3,380 to 3,286 acres and the average annual direct damages from the flooding of those crops will be reduced 95 percent from \$ 63,620 to \$3,175.

Proposed project actions will change the characteristics of 10.5 miles of presently existing channel. Changes in physical characteristics involve primarily deepening and providing more gradual slopes to the banks. This will result in wider top widths. These changes are indicated in Table 28.

Colder waters supplied to the Rogue River are provided by several tributaries. These tributaries will either not have channel work performed on them or exposure of their waters to the sun's warming rays will not be significantly increased. The tree and shrub plantings on the spoil area along the Rogue River and Kosten Drain and Danials Creek Drain should reduce erosion, improve the aesthetics of the channel, provide some increase of woodland habitat, and in time provide shade for streamwater cooling.

The large block of wildlife habitat comprising the Rogue River State Game Area in Kent County will be unaffected. The swampy areas in the flood plain that presently act to slow floodwater runoff will continue to do so after project installation. Base flows and water temperatures are not expected to change and the proposed project should have no effects on coliform count, dissolved nutrients, or Agri-chemical concentrations, although no quantitative information is available.

The extent of land use changes in the watershed as a whole are not known. There are expected to be no land use changes in the problem area other than the 182 acres directly and permanently affected by structural measures. These changes are indicated in Table 29.

TABLE 29 - WILDLIFE HABITAT CHANGES AS A RESULT OF PROJECT

	<u>Present Acres</u>	<u>With Project Acres</u>	<u>Change</u>
Grassland	77.1 (56.0)*	167.8 (134.2)*	+90.7 (+78.2)*
Woodland	10.3 (8.3)	13.8 (11.0)	+ 3.5 (+ 2.7)
Cropland	94.2 (19.4)	0 (0)	-94.2 (-19.4)

* Numbers in parentheses represent habitat value expressed in terms of prime acres as determined from SCS criteria.

Streambank protection, and shrub and tree plantings will change 129 acres of channel banks and sandblow areas to established vegetation within two to twelve years.

The effects of these changes on wildlife habitat will be infinitesimal when compared to the 155,760 acres in the watershed. The effect of these known changes on the recreational resource will likewise be infinitesimal, not only because of the limited acreage involved but also because of the difficulty of public access to most of those acres.

There is, by definition, no effect of project measures on any other ecosystem in the biosphere. The effects of this project on marine life are not known, and since the presence of any rare or endangered species in this watershed--either as a migrant or resident--is not known, the effects of project actions on such species are unknown.

No recreational use of channel rights-of-way is anticipated except by the landowners and their guests. Public use will be permitted only by permission. No motorized vehicles will be allowed in order to protect tree plantings and prevent erosion of the sandy channel banks.

A Natural River District is an area designated to control land quality, land development, land use, and other river activities. The Rogue River District is a strip of land 300 feet wide on each side of and parallel to the river. Establishment of this District in no way implies a taking of private lands by the state or opening them up to public use. Private land remains private and subject to the rights of private ownership with respect to public use. Existing structures are not affected, but certain types of development will be controlled in the future throughout the District. In other words, future development will be restricted to that (1) which will not be injurious to most of the existing private development, (2) which will not degrade the river's natural values, and (3) which will limit development where risk of flooding exists.

A special archeological survey was conducted in the Rogue River problem area. It was determined by Donald Weston, Archeological Survey, Michigan History Division, that "these sites are not in any immediate danger of being destroyed by the watershed project, as proposed." But if any sites should be discovered, Mr. Weston's office will be contacted before construction work continues.

ECONOMIC AND SOCIAL

Farm income in the problem area will increase due to increased production, increased efficiency, improved crop quality, and more intensive land use. The project will also encourage and enable farm operators to use better management techniques.

Income of farm operators in the problem area will be increased by \$529,875 the amount of total annual primary benefits. Since the problem area is small and Grant now has a limited capacity to supply agricultural goods and services, there will be some multiplier effect within the problem area, as estimated in the \$110,360 of local secondary benefits. It can be expected that the increased expenditures for consumer goods and services within the watershed area will also increase, but probably by a lesser amount.

The increase in the local tax base would be comparatively small, based on that portion of the \$529,875 annual direct benefits that would be channeled into taxable property improvements. Few buildings exist within the problem area and since no competitive land uses readily exist, it is likely that the structural measures themselves will increase taxable property values.

Although parts of both Kent and Newaygo Counties can be expected to grow rapidly between 1970 and 2000, this should only have a significant impact on land use in the Kent County portion of the watershed.

The watershed's amount and availability of natural, open and recreational spaces seems near capacity now. But areas of the watershed have sufficient water surface, forest, scenic and other relatively undisturbed lands which might be added to existing recreation and conservation facilities over time, at the expense of other recreational uses such as hunting.

Structural measures will provide flood protection and improved drainage on a total of 3,660 acres. A total of 40 landowners will be affected directly, most of whom depend on the production of agricultural products as their primary source of income. Farm income increases will enable landowners to enhance the physical appearance of farmsteads.

Project measures should lessen the effect of seasonal floods which cause fluctuations in local employment incomes and production. This will also increase the ability of businesses and of family owned and operated farms to continue their operations. People and businesses in the Rice Lake Basin and the community of Grant are directly affected, including nine local packing and marketing operations, 70 other small

business establishments, and between 250 and 300 families of migrant and local seasonal workers. Regional effects will also be felt in the nearby markets, processing and transportation centers of Fremont, Kalamazoo and Grand Rapids where problem area produce is handled.

The project will immediately improve the quality of life for farm families and others by reducing the risk of seasonal crop damages and the layoffs that have resulted in the past. Other significant but difficult to measure impacts are keeping young people in the area and attracting new businesses, speeding farmers' loan repayments, support of schools and local utilities, and maintaining political influence.

The detailed soil survey will provide the information necessary for planners to make better land use management decisions. It will be ready reference for government agencies, planners, developers, and individuals. Through intelligent use of the survey, the destruction of prime agricultural land and wetlands can be prevented. Monetary damages to individuals and developers from building on unsuitable soils can be reduced or prevented. Pollution and waste disposal problems can be reduced or eliminated by avoiding use of soils with poor drainage and soils that provide catchment for groundwater resources for urban developments. Use of the survey will aid in reducing runoff, erosion and sedimentation.

The flood plain study will help in management of the Rogue River Valley by:

- 1) Providing state and local units of government with appropriate technical information and interpretations for use in flood plain management.
- 2) Providing technical services to managers of flood plain property for community, industrial and agricultural use.
- 3) Improving basic technical knowledge about flood hazards.

A flood plain delineation is the basic tool used to establish a flood plain ordinance. This type of ordinance is necessary to manage and control development in the flood plain. This approach can reduce damages caused by improper development and can simultaneously protect scenic and environmental resources.

Land treatment measures will reduce sediments contributed from all land categories by wind and water. Streambank protection measures will reduce sediments deposited directly into watercourses from streambank sloughing, caving and seeping. Windbreaks, a land treatment measure,

will help protect some 3.8 miles of channel from windblown soils and will give good wind erosion protection to 85 acres and some protection to 560 acres of muck. Rogue River and Danials Creek tree plantings, a structural measure, will protect spoil banks from eroding and supplying sediment to the channel. Kosten Drain tree plantings, a streambank protection measure, will likewise directly protect 1.7 miles of Kosten Drain and indirectly protect downstream reaches.

Good forest management, harvesting with good techniques, and timber stand improvement will increase the productivity of desired goods and services on forest lands. This will in turn provide for desirable employment and income. Forest insect and disease assistance will help reduce the high mortality and reduction of growth each year to trees which are converted to timber products and contribute to the aesthetic appeal and environmental quality of urban, park, and greenbelt areas. Urban-environmental forestry assistance will help protect and establish trees and shrubs associated with open spaces, natural beauty areas, and greenbelts around urban and built-up areas. This assistance would be available to planning boards, community leaders, and developers in formulating and implementing effective land use planning. Forest land wildlife habitat improvement measures will help create favorable environment, food and cover for both game and non-game animals through vegetative or silvicultural means and forest land protection.

Sediment and erosion will increase on 220 acres adjacent to 11.6 miles of channel during the construction period (2 years) and the period of revegetation (9 months for grasses and 3-10 years for shrubs and trees).

As a direct result of the project, water quality in the Rogue River is not expected to exceed the allowable limits listed previously except for sediment during the construction period, which will be effectively controlled by a debris basin with a straw baffle. Water temperatures will be held down by containing lower flows in bench-style channel bottoms to reduce the water's solar-receptive surface.

INTERNATIONAL IMPACTS

There will be no international impacts as a result of this project.

FAVORABLE ENVIRONMENTAL EFFECTS

1. Increased agricultural efficiency on 3,324 acres of muck which are already intensively managed.
2. Reduction of gross erosion rates by 45 percent from 4.5 to 2.5 tons per acre per year.
3. Enforced management for future use of the Rogue River floodplain to maintain the natural features of the area.
4. Reduced average annual flood damaged received by 40 landowners on 3,660 acres and by the related area economy. The reduction is from \$79,280 to \$9,305 or 88 percent.
5. Decreased channel maintenance needs which result in less habitat disturbance and annual savings to \$2,860 to landowners.
6. Improved water quality in the Rogue River trout fishery as a result of sediment reductions and temperature protection.
7. Improved employment stability for approximately 300 families of local residents and migrants. Income of farm operators will be increased by \$519,375 annually.
8. Increased prime woodland wildlife habitat by 4.4 acres.
9. Increased prime grassland wildlife habitat by 69.2 acres.
10. Net removal of 94 acres of cropland from crop production.
11. Reduce wind erosion in the sandblow areas to near-zero rates.
12. Reduce surface water run-off by about 1 percent.
13. Project output will make available regional funds and resources that can be used to enhance the physical appearance of about 40 farms on 3,660 acres.
14. Change 129 acres of channel banks and sandblow areas to established vegetation within 2 to 10 years.
15. Reduce average sheet erosion rates on cropland by 53 percent from 6.2 to 3.0 tons/acre/year.

16. Reduce sediment accumulation to the mouth of the watershed by 47 percent from 42,000 to 22,000 tons/year.
17. Protect water temperatures for designated fisheries use on the Rogue River in Kent County.
18. Reduce average annual agricultural flooding by 92 percent from 600 to 30 acres.
19. Provide management for 2,420 acres of forest land.
20. Provide wildlife food and cover from crop residues left on fields as part of land treatment measures.

ADVERSE ENVIRONMENTAL EFFECTS

1. Temporary (construction period plus 9 months) disturbance of wildlife habitat in the construction area.
2. Temporary (construction period plus 2 years) destruction of benthos community of 10.5 miles of stream.
3. Shift of 94 acres now in crop production to grassland with shrubs.
4. Noise pollution from construction will exist for about nine months during construction.
5. Sediment and erosion will occur along 11.6 miles of channel during construction until stabilized.
6. Loss of fossil fuels used in construction work.

ALTERNATIVES

As in any project, there are numerous alternatives and combinations thereof which can be considered. Many of these are strictly engineering variables of the same basic project and are not considered separate alternatives. However, of the others, not all are realistic, and many were considered to a point where they proved to be impossible or unworkable. Five alternatives in addition to the "no project" alternative appeared to be the most reasonable and are discussed further. They include accelerated land treatment alone, use of Ransom Lake as a flood water reservoir, diking of the Rogue through the damage area, channeling the Rogue through the damage area, and reflooding the problem area for fish and wildlife and recreational use.

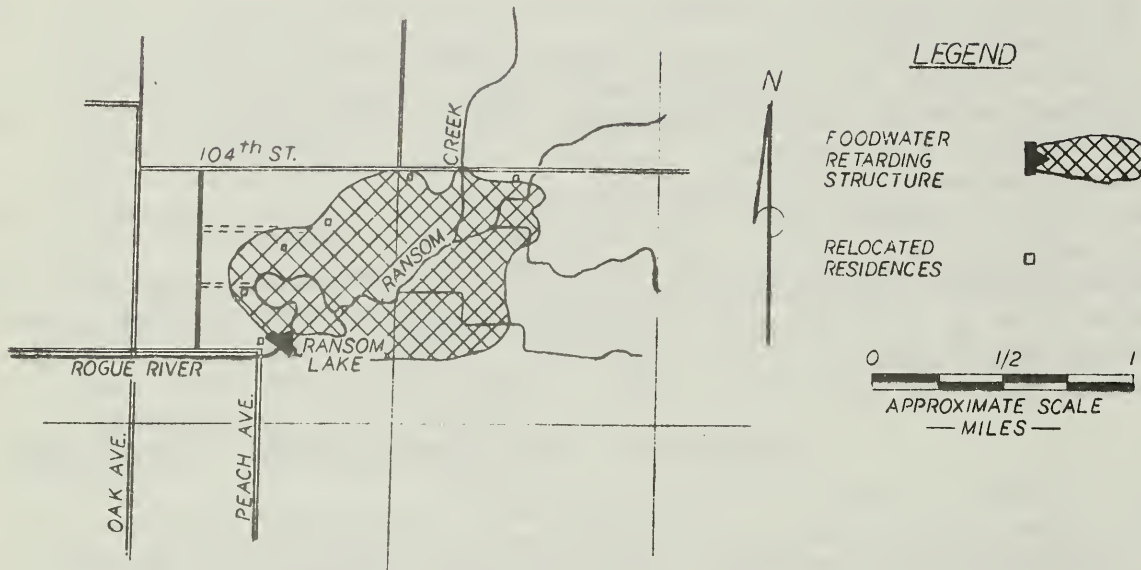
In the lower 21 miles of the Rogue River, structural measures to alleviate the flood problem are not economically feasible and in most cases neither is flood-proofing. Flood plain management including application for and implementation of a flood insurance program is necessary to guide proper land use and prevent development which would be subject to flood damage.

ALTERNATIVE 1-ACCELERATED LAND TREATMENT

The traditional approach of accelerated conservation land treatment by working with landowners to install conservation practices on their land which would minimize soil erosion and reduce flooding is one alternative. Installation of such measures as conservation cropping systems, tree planting, windbreaks and forest management would be beneficial in reducing erosion, sediment and surface runoff. Sediment damages would be reduced about 50 percent. In addition, many conservation practices of this type tend to improve the visual quality of the landscape and improve wildlife habitat. The cost of this alternative is estimated to be \$1,990,000.

An annual damage reduction of less than one percent (\$640) will occur.

ALTERNATIVE 2 - RANSOM LAKE FLOOD STORAGE

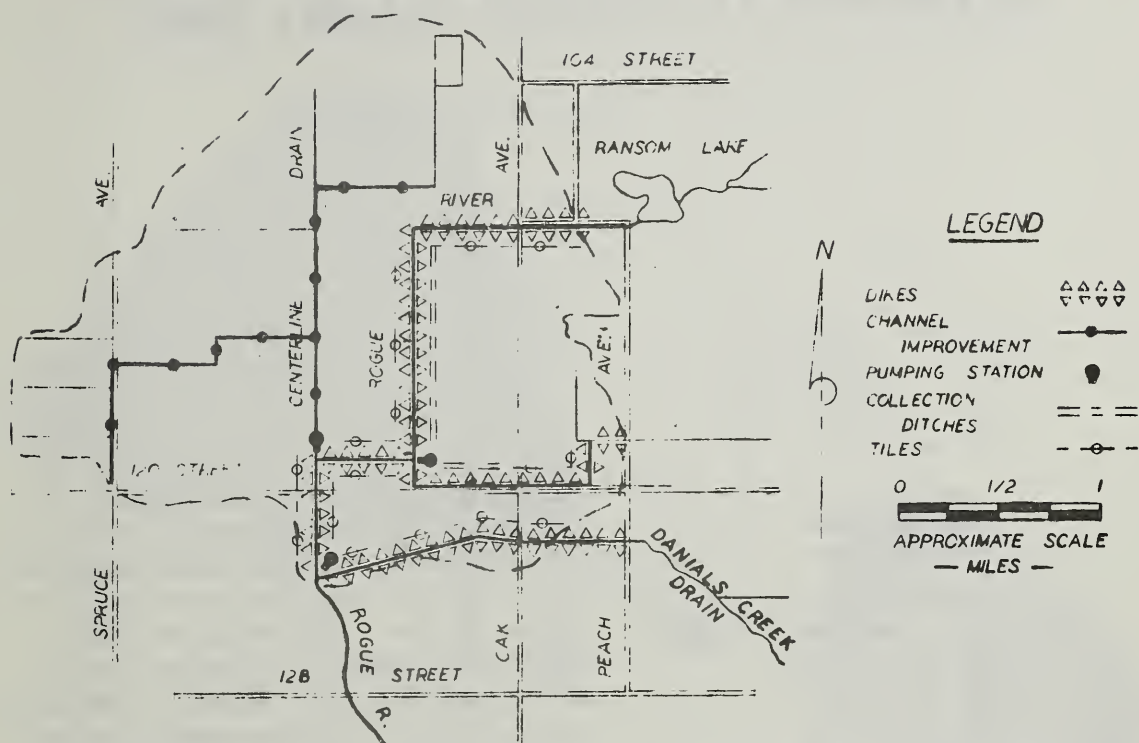


Utilization of Ransom Lake as a floodwater storage reservoir and accelerated land treatment would permit the controlling of a major part of the drainage area above the problem area. This would require the construction of a 12-foot high dam across the lake outlet to regulate discharges from the lake. The cost of this alternative is approximately \$1,485,800, including six relocations.

Because the uncontrolled area above the problem area would still be fairly large, floodwater damage reduction would be minor -less than one year protection. No drainage improvement would be realized and the fluctuating water levels in Ransom Lake would be detrimental to the drainage of agricultural lands upstream as well as the fishery of the lake. In addition, a prehistoric village site adjacent to the lake would be inundated, and six rural homes would have to be relocated.

Ransom Lake flood storage can also be considered as an alternative to the channel work on the Kosten and Danials Creek Drains and the north-south diversion from the Rogue River to Danials Creek Drain. This would eliminate the need for any disturbance of the stream bottom and banks along the Kosten and Danials Creek Drains and the disturbance of 84 acres of land for the diversion.

ALTERNATIVE 3 - DIKING



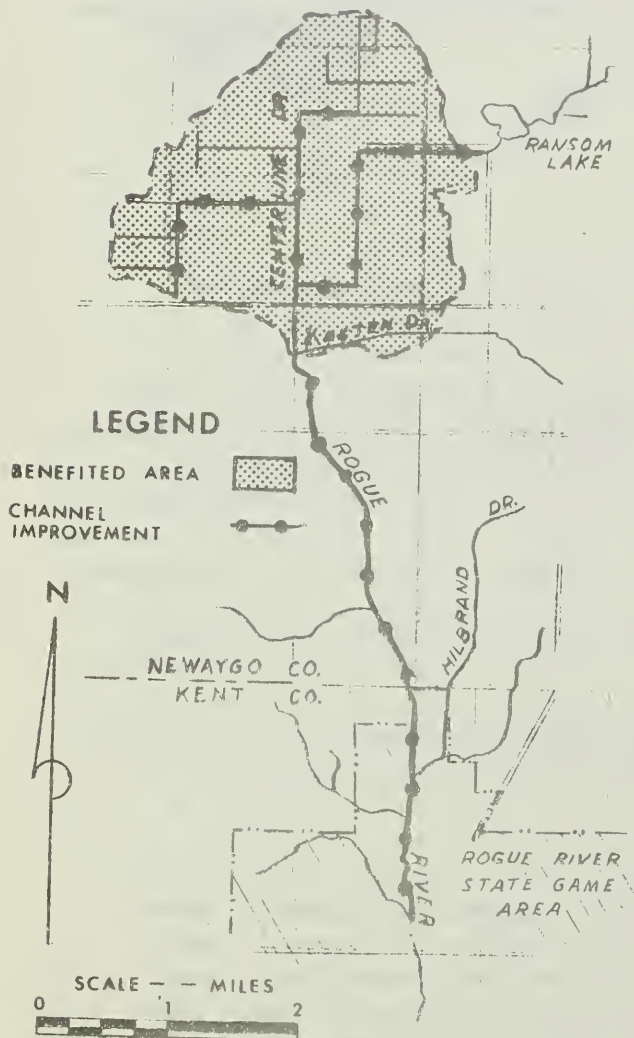
Construction of a system of dikes to contain the Rogue River through the damage area, plus accelerated land treatment, is an alternative to help solve the problem. This system would require approximately 5 miles of dikes on both sides of the Rogue River, 120th Street Drain, and Kosten and Danials Creek Drains. This would require three major pumping stations, a system of collection ditches to remove surface water behind the dikes, and channel work along the Centerline Drain and its tributaries.

No suitable embankment material is available locally and additional costs will be incurred to transport fill to the site. Total cost of this alternative is approximately \$3.6 million with \$186,000 of the total for land rights.

Diking would provide the same degree of flood protection and would improve the drainage on the 3,660 acres of land which is presently having a problem.

Impacts resulting from this alternative are varied. Approximately 200 acres of cropland would be lost due to land requirements for the dikes. Channel bottom and banks of the 5 miles of channel which would be diked would not be disturbed. Solving of the sediment problems in the upper part of the Danials Creek Drain have not been included. This would add in excess of \$130,000 to the above cost.

ALTERNATIVE 4 - EXTENSION CHANNEL WORK



This particular alternative differs from the selected alternative through the elimination of the proposed pumping station just north of the confluence of the Rogue River and the Kosten Drain and extending the channel work 2.5 miles further downstream to obtain an adequate outlet. The cost of this alternative is \$3.3 million.

A ten year level of protection (same as the selected alternative) and accelerated land treatment would be provided by this alternative. Relief from flooding and poor drainage in the problem area and the erosion and sediment problems in the Rogue River would be achieved. Extending the channel would necessitate excavation into the Rogue River State Game Area where the river is essentially in its natural state. This would have a serious effect on the trout fishery existing in this part of the stream. In addition approximately 100 acres of Type 1 wetlands would be lost and the aesthetics of this meandering stream would be damaged.

ALTERNATIVE 6 - NO PROJECT

This alternative would not change the existing environment. The watershed would essentially remain as outlined in the "Environmental Setting" section of this report, and would still be plagued with problems that led to the initiation of this project.

Although Soil Conservation Service's ongoing programs would continue to function and provide technical assistance for the installation of land treatment, it would not be at the accelerated rate. This delay could result in the loss of several years in time before the flood hazard analysis could be carried out and the resulting ordinances established.

Without the project the impaired drainage and flooding problems would continue to increase causing greater damage to agricultural production. Gradually, agriculture would decrease in intensity and number of acres cropped. Approximate average annual direct and indirect monetary damages which would occur is \$51,000. (See Appendix A). It is estimated that without implementing the project the net annual benefits from all purposes which would be lost are at least \$501,525.

SHORT TERM vs. LONG TERM USE OF RESOURCES

Land use trends in the watershed area are dependent upon the land's proximity to urban areas. Trends over the years have shown that around urban areas agricultural land is converted to idle and then to suburban living areas and country estates. This is occurring in the lower part of the Rogue River Watershed. Away from this urban influence, trends are directed more toward clearing forested land and small woodlots, and draining wet, swampy areas for agricultural use. Although there is no woodland in the Newaygo problem area this trend is consistent with those of the upper part of the watershed.

One area where this will not happen is along the Rogue River itself where the Michigan Department of Natural Resources is proposing a Natural Rivers Plan. If adopted, this plan will preserve and protect the river and parts of its flood plain from most forms of permanent human encroachment. This proposed project will not infringe upon the purposes of the Natural Rivers Plan.

This project will also maintain the agricultural productivity and improve agricultural efficiency in the old Rice Lake Basin. This purpose would seem to be compatible with the long-term land use trends in the upper portions of the Rogue River Watershed. The project will effectively solve long term flooding in the problem area from the higher frequency events (one- and two-year floods) and reduce the magnitude on less frequent floods (10- to 50-year events). It will also minimize erosion and sedimentation. This is consistent with desires of local organizations and should provide a more desirable environment in the long run.

Approximately 94 acres of land adjacent to channels will be removed from agricultural production as a result of the project. The disturbance of the top-soil, coupled with the high cost of earth-moving, render impossible a future reversion of this land back to the present level of agricultural production. While the agricultural productivity of 3,324 acres in the problem area will be maintained or enhanced, it should be realized that 94 acres of land, presently in an agriculturally productive state (except for damages due to flooding

and poor drainage) will undergo a change in use. The wildlife productivity of the entire Newaygo problem area will also be maintained or enhanced as a result of project action.

It is assumed that many of the benefits derived as a result of project actions will continue at the close of the 50 year project life. Proposed construction and maintenance measures are selected and designed to provide benefits for 50 years if not modified by unpredictable natural or social phenomena. However, proper maintenance including periodic clean out could prolong the effectiveness of the channels and sediment basins beyond the 50 year project life.

The Rogue River Watershed is located in the Grand River Basin which is a part of the Lake Michigan Subbasin of the Great Lakes Water Resources Region. The following PL-566 projects are also located in the Grand River Basin (Table 30).

TABLE 30 - EXISTING PL-566 PROJECTS IN THE GRAND RIVER BASIN

<u>Project</u>	<u>Acres</u>	<u>Status</u>
Catlin Waters	2,800	Completed
Muskrat Creek	7,650	Completed
Fowlerville Drain	1,500	Undergoing Reformulation
East Upper Maple River	167,730	Under Construction
West Upper Maple River	25,730	Under Construction
Hayworth Creek	66,810	Planning Suspended

The main objective of these projects is to protect and enhance land now in agricultural production by providing flood protection and improving drainage. Each project is designed to solve problems independently within its own area and is not dependent upon any other PL-566 project for achieving benefits. Cumulative effects of this project and the others in the subregion have been considered and it was determined that they are essentially nonexistent.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction of the channels will affect 182 acres of land adjacent to the channels. Approximately 94 acres of this land is now in crops and will be irreversibly and irretrievably converted to channels, berms, and spoil areas. The remaining 88 acres which are now in grassland and woodland will remain in those uses.

Certain materials such as fuels and lubricants needed for the construction and operation of the channel, sediment basins, pumping station, and grade stabilization structures will be irretrievably lost.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

GENERAL

This PL-566 project for the Rogue River Watershed has been under development since June of 1969 when an application for assistance was approved by the State of Michigan. Subsequently, when approved by the Soil Conservation Service, contacts were made by letter with various interested and involved federal, state, and local agencies which have jurisdiction in the area.

In February 1970, a preliminary investigation report was published by the Soil Conservation Service and distributed for review and comment. Since then numerous Tri-Agency Fish and Wildlife Coordinating Committee meetings have been held at which this project was discussed. Recommendations of this group were incorporated into the planning efforts and influenced the selection of the proposed alternative.

Preliminary proposals to relieve flooding and provide adequate drainage were based on channel work on the Rogue River from the benefited area about 4 1/2 miles downstream. This would have extended into the Rogue River State Game Area about 1 1/2 miles. There was concern that bank cover would be destroyed and trout habitat would be damaged. The result of this was to limit channel work to 1.8 miles in this area, divert some flood water around the damage area and install pumps to satisfy the remaining need for flood prevention and drainage.

Another concern was that water temperatures not be raised. It was felt that channel construction, providing for a low-flow channel on the shaded side, would not raise temperatures and might possibly lower them.

There was concern about sediment production. Sediment basins and bank stabilization were proposed and at the suggestion of a Michigan Department of Natural Resources Fisheries biologist, straw baffles are proposed during construction to further control sedimentation and keep it out of the downstream trout waters.

Local sponsor indecision caused planning efforts to be suspended in February 1971. Meetings were held periodically after that date and, in January 1973, planning by the State Watershed Planning Unit of the Michigan Department of Agriculture (since transferred to the Department of Natural Resources) was resumed. In February 1973 articles appeared in local papers announcing the resumption of planning and giving background information.

In March 1973 letters were sent to various federal, state, and local agencies requesting information on fish and wildlife habitat, erosion and sediment clean-out from drains, and archeological and historic sites data. As a result of concern by various responders, an archeological field investigation was carried out and the plan was modified to increase protection against potential sedimentation which is a major problem in drain maintenance.

A public meeting was held to discuss the planned project and its impact upon the environment. Public notices were placed in local papers and all environmental groups were notified by letter according to existing Soil Conservation Service procedure. At this time the entire project was reviewed and questions answered by representatives of the sponsoring local organization and representatives of the Soil Conservation Service. The statement was revised to reflect concerns and comments brought forth at this meeting.

The following is a list of agencies and other sources from which written comments on the draft Environmental Impact Statement were requested and the following lists indicate those who responded and those who did not.

RESPONDED

Department of the Army
Department of Health, Education and Welfare
Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
Michigan Department of Agriculture
Michigan Department of Natural Resources

NO RESPONSE

Department of Agriculture - Office of Equal Opportunity
Department of Commerce
Department of the Interior
Federal Power Commission
Great Lakes Basin Commission
Governor of Michigan
State Clearinghouse
Regional Planning Commission - West Michigan Region 8
Natural Resources Defense Council
Friends of the Earth

Environmental Defense Fund
National Wildlife Federation
National Audubon Society
Environmental Impact Assessment Project
USDA Agriculture and Stabilization Service - Michigan
USDA Farmers' Home Administration - Michigan
Michigan Senate - Agriculture Committee
Michigan Senate - Conservation Committee
Michigan House of Representatives - Conservation Committee
Michigan House of Representatives - Drainage Committee
Michigan Department of Agriculture - Soil & Water Conservation
Division

Michigan Soil Conservation Districts, Inc.
Michigan State University - College of Agriculture and Natural
Resources
University of Michigan - School of Natural Resources
Cooperative Extension Service
Kent County Board of Commissioners
Newaygo County Board of Commissioners
Grand River Watershed Council
Michigan State Chamber of Commerce
Michigan League of Women Voters
Michigan Association of Conservation Ecologists
Michigan Audubon Society
Michigan Botanical Club, Inc.
Michigan Natural Areas Council
Michigan United Conservation Club
Sierra Club - Conservation Committee
The Nature Conservancy - Michigan Chapter
Trout Unlimited, Michigan Council
West Michigan Environmental Action Council
Michigan Student Environmental Confederation

**DISCUSSION AND DISPOSITION OF EACH
COMMENT ON DRAFT ENVIRONMENTAL
IMPACT STATEMENT**

ENVIRONMENTAL PROTECTION AGENCY

1. Comment: "The project description indicates there are 11.6 miles of channel dredging and improvement planned for several drains within the watershed. Additional information should be provided in the Final EIS on the quantity of material to be dredged, the new depths of the channel, the polluttional status of the materials dredged and the stability of this material for bank construction."

Response: Approximate quantity of materials to be excavated of 472,000 cubic yards is listed on page II-16. Existing channel configurations including depth are given in the planned project section on pages II-17 through II-25. Flow depths for the designed channels are shown on Table 3, page I-38. Average change in depth is being added in the narrative for each reach. Prior to any excavation work, detailed sampling and sediment analyses will be made to determine if the material is polluted. EPA guidelines will be followed to determine if special precautions are needed in handling dredged materials. Analyses of materials will be forwarded to EPA for review. Excavated materials will not be used for bank construction. Materials will be spoiled and placed as shown on Figures 3, 5 and 8.

2. Comment: "Since there are high concentrations of heavy metals in the water, there is the possibility that the concentrations of metals in the bottom sediments would exceed our criteria for unconfined disposal. Bottom sediments should be sampled and analyzed from several locations along the channels to be dredged. The criteria for bottom sediment analysis have been previously sent to your office."

Response: Water chemistry sample stations are about 25 miles downstream from planned channel work. Michigan Department of Natural Resource's review comments indicate "the levels of heavy metals, . . . are very near normal background levels." Bottom sediment analysis will be made as described above.

ENVIRONMENTAL PROTECTION AGENCY (continued)

3. Comment: "Furthermore, the EIS should discuss how dredging and channelizing the drains will reduce the damages from flooding and how this will change the peak periods of flooding downstream."

Response: Inadequate channel capacity and depth results in flooding and impaired drainage as discussed in the problems section of the EIS (pages II-70 through II-74). Increased channel sizes as listed in the planned project section, pages II-17 through II-26 and Table 28, page II-90 reflect changes. This will allow tile to outlet properly as well as carry the peak flood flows.

Data, indicated on pages II-85 and 86, are based on detailed flood routings of without project and with project conditions. Pumping an increased drainage area of about 1.3 square miles as well as the way planned structural measures function together result in decreased downstream peak flows for the infrequent events.

4. Comment: "Due to the unstable nature of the soils within the watershed, the EIS should explain whether or not vegetation will permanently establish on a 2-1/2:1 side slope. Berm material placed on the sides of the channels may overload the bearing capacity of the in-place soils and induce additional sloughing. On pages 66 and 67, the EIS indicated that soils are unstable and do not provide sufficient root anchorage to prevent erosion. Thus, it would appear that the spoil banks may be unstable and may not support vegetation. This condition would cause the cold water fishery to be severely impacted due to increased turbidity."

Response: Lack of vegetation on channel banks is due primarily to steep side slopes and improper seeding techniques. Grasses, legumes, shrubs, and trees selected for seeding and stabilization plus proper mulching will assure permanent vegetation. In addition, an establishment period of up to three

ENVIRONMENTAL PROTECTION AGENCY (continued)

years after construction will allow correction of minor unknown site conditions or latent defects thus resulting in the prompt establishment of adequate vegetative cover. If soil investigations for final design show that spoil needs to be placed more than 15 feet back from the channel as indicated in the EIS, changes will be made to assure that sloughing will not take place.

5. Comment: "Since there are 1.1 miles of new channel proposed for this project, a more detailed description of the area, impacts and purpose of the new channel should be provided."

Response: Purpose of the new diversion channel is discussed in paragraph four, page II-13 and on page II-26. Description of the area is included in pages II-25 and II-26. Impacts are included as a part of the whole section starting on page II-83.

6. Comment: "Where channel work is planned, it should be conducted on the north and east sides of the channels. This would allow the existing vegetation to remain on the south and west sides of the channels, thus minimizing water exposure to the peak periods of sunlight. By minimizing the exposure to sunlight the channels should remain suitable as a cold water fishery. We also recommend that extensive plantings be made on the south and west sides of the channels."

Response: Much of the planned channel work will be conducted on the east side, wherever possible, as suggested by this comment and detailed in the EIS. Other considerations such as minimizing disturbances, and reshaping side slopes for stabilization are also important considerations for selecting work areas and locations. All of the channel work will be on second quality warmwater streams and will not directly affect any coldwater fisheries.

ENVIRONMENTAL PROTECTION AGENCY (continued)

7. Comment: "As noted previously, heavy metals have been detected in the Rogue River. Since it is planned to dredge the City of Rockford's water supply reservoir, the EIS should discuss the anticipated impacts on the water supply--whether or not the water supply facility has adequate treatment to counteract additional pollutional loads resulting from the dredging operations. In addition, the EIS should explain whether or not the City of Rockford has experienced high levels of heavy metals previously and if it is anticipated that the concentrations of heavy metals will increase."

Response: There is no anticipated impact of the project on the Rockford water supply reservoir. Several erosion control measures, described in the EIS, plus the distance between the planned project and the reservoir support this response. Although there are traces of heavy metals indicated in water quality tests these are within normal background levels (indicated in response number two above) and are not expected to increase.

8. Comment: "As a result of the project, more intensive agricultural land use is forecasted, probably increasing the use of fertilizers and thus the nutrient runoff to the stream. Increased nutrients could adversely affect drinking water supplies. The Final EIS should provide the assurance that drinking water will meet the Interim Primary Drinking Water Standards published in the March 14, 1975 Federal Register."

Response: We can provide no assurances about drinking water meeting published standards because of the great distance between the planned project and the water supply reservoir and the large difference in drainage areas. It is agreed that more intensive agricultural land use will result with implementation of the project. Increased use of fertilizers plus reduced flooding and impaired drainage problems will promote more plant growth and reduce leaching and runoff of nutrients.

ENVIRONMENTAL PROTECTION AGENCY (continued)

9. Comment: "One of the purposes of the project is to increase the drainage from the project area. However, the area where specialty crops are grown (formerly Rice Lake) appears to be dependent on a high water table creating mucky soils. The EIS should discuss how this area will be affected by the changes in the drainage patterns."

Response: Seven water level control structures and the pumping stations, described in the Planned Project Section, will allow management of water levels within the muck soils area. This will prevent overdrainage of these soils to help control subsidence. Paragraph five, page II-88 in the Impact Section has been expanded to reflect this.

10. Comment: "On page II-33, it was indicated that there were oil and gas wells within the watershed. Part of the project agreements should require proper maintenance of these facilities and the associated storage and transfer facilities to assure that oil is not introduced into the stream. All depleted wells should be capped and sealed and active wells, pipelines and storage facilities should be inspected for leaks and spills."

Response: We are required to discuss oil and gas resources as a part of the environmental setting. These are not a water and related land resource problem nor are they discussed in the problems section of the EIS because this project will have no affect on these resources. This authority is vested in the Michigan Department of Natural Resources.

11. Comment: "The flood plain study that will be conducted as part of the project should be described in greater detail in the Final EIS. Until the flood plain study is completed and permanent recommendations for the minimization of flood damages have been made, we recommend that there be no further development in the flood plain areas."

ENVIRONMENTAL PROTECTION AGENCY (continued)

Response: Planned flood plain study will be conducted in detail according to standard hydrology principles agreed to by the Soil Conservation Service and the Michigan Department of Natural Resources. Under the established procedures, detailed field surveys of the channels, bridges, flood plain and other structures are made to enable computation of hydraulic characteristics of the stream. Soils, land use and rainfall-runoff determinations are used to predict flood peaks and elevations. These data are presented graphically and on aerial mosaics to assist planners, governmental officials and homeowners in determining flood plain boundaries. Additional information has been added to page II-12 to more fully explain the procedures.

We agree that no flood plain development should take place until flood plains have been delineated.

12. Comment: "Alternative #5, Reflooding of Rice Lake described on page II-103 should be expanded to further discuss the beneficial and adverse impacts of implementing this alternative. Information which should be included are the effects on water quality, the effects on flood control and the value of fish and wildlife habitat created versus the loss of specialty farming."

Response: This alternative was determined to be not feasible by 1971 DNR studies. Very little work has been done since that time.

Water quality would not be affected other than a slight increase in temperature resulting from the large shallow area of water exposed to the sunlight. Flood control would not be needed in the muck area without farming, and storage of floodwater would have little effect on reducing damages in the lower Rouge River floodplain.

ENVIRONMENTAL PROTECTION AGENCY (continued)

The value of the fish and wildlife habitat created is difficult to assess since the experts cannot arrive at any values. Values created would be essentially those associated with shallow lakes since woody vegetation is scarce. Loss of specialty farming would force the farmers out of business, seriously curtail the nearby processing plants, and reduce the produce available on a regional basis.

The second paragraph on page II-103 has been reworked to indicate the concerns of this comment.

13. Comment: "The EIS indicated there would be a reduction in the sediment load from 4.5 tons/acre/year to 2.5 tons/acre/year through the cooperation of participating landowners. These options have been available to landowners for a number of years with limited acceptance. There should be greater discussion of how it is proposed to change this situation and what alternatives are available in the event a satisfactory degree of cooperation is not achieved. The EIS should also discuss what safeguards there are to assure that landowners carry out their share of the project once the channel improvements have been completed."

Response: Reduction of sheet erosion requires cooperation of participating landowners and is in turn dependent in part on installation of structural measures for flood prevention, drainage, and stabilization. Accelerated technical assistance with the project will result in an increase in conservation treatment. Local sponsors desire to have the project constructed and have pledged \$611,025 of local monies to fulfill their obligation for installation of land treatment measures.

Paragraph three, page II-11 defines a conservation plan and implies that participation is voluntary. Paragraph two has been expanded to indicate that experience in other Michigan watersheds shows that about 85 percent of planned land treatment measures have been applied. Goals have been exceeded in

ENVIRONMENTAL PROTECTION AGENCY (continued)

many agronomic, cultural, and wildlife measures. Drainage measures lag behind other measures because of cost and time factors.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

1. Comment: "Under the heading Land Treatment Measures it is implied that some 9,710 acres of land will be treated by the implementation of this project. It should be made clear in the statement that these practices will only be carried out on lands where the landowner has requested assistance. It is our understanding that participation is voluntary, and agreements can be terminated by either the SCS or landowner at any time. Will the effectiveness of the overall plan be diminished without full cooperation and participation by the landowners involved? We suggest this be discussed in the EIS."

Response: Paragraph three, page II-11 defines a conservation plan and implies that participation is voluntary. Paragraph two has been expanded to indicate that experience in other Michigan watersheds shows that about 85 percent of planned land treatment measures have been applied. Goals have been exceeded in many agronomic, cultural, and wildlife measures. Drainage measures lag behind other measures because of cost and time factors.

2. Comment: "The total project costs, as broken down in Table 7, do not include the annual operation and maintenance costs estimated at \$12,390. We suggest that this be identified as project maintenance and added to Table 7 on page II-23 as a foot-note, as a continuing part of the total project costs."

Response: Operation and maintenance cost estimates are discussed in the text on pages II-26 and 27. In addition, amortized costs shown in Appendix A includes installations costs as well as annual operation and maintenance costs.

3. Comment: "It is stated on page II-17 and continued on page II-18 that the debris basin will be cleaned out when construction is completed and will be maintained by the county. We urge that it be clearly spelled out in the statement that the debris basin will be frequently inspected and maintained as

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

necessary during the course of construction. We further recommend that the immediate measures to stabilize the banks with permanent soil erosion control practices, as indicated in the statement, be inspected by the appropriate drainage official to insure their effectiveness. It is assumed that post project maintenance by the Inter-County Drainage Board will include clean outs of the debris basin as needed."

Response: Inspection of debris basins, bank stabilization, and other soil erosion control practices are a continuing responsibility of project engineers and inspectors which are assigned to the project. Local sponsors may also inspect the work during construction. Pages II-17 and 19 indicates that the debris will be cleaned out at the completion of construction and will be maintained by the local sponsors.

4. Comment: "It should be indicated in the statement that it will be necessary for the Inter-County Drainage Board to obtain a permit under the Soil Erosion and Sedimentation Control Act of 1972 from the appropriate county enforcing agency. Careful consideration should be exercised to prevent downstream streambed and bank erosion which commonly results where dredging activity increases stream velocities."

Response: Paragraph three, page II-16 indicates applicable state laws will be followed. The Soil Erosion Act is no exception.

5. Comment: "The statement should include a discussion of provisions that would assure that the grassed berms, strips and slopes are not disturbed by farm equipment and livestock. For example, is cost-sharing available under any federal program for fencing off and stabilizing areas with gravel where cattle will have access to these streams? A more satisfactory method would be to supply livestock with

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

well water to avoid damage to streambeds and banks. We suggest this matter be discussed in the statement."

Response: Livestock and cattle will not have access nor disturb banks or berms. Discussion on pages II-20, 22, 24, 25, and 26 indicates that berms will be seeded and maintained. In addition, an operations and maintenance agreement is implemented between SCS and the local sponsors before construction starts.

6. Comment: "We feel that the discussion of project impact on stream temperatures should be expanded. It is frequently mentioned in the statement that the protection of temperatures in the project area is a favorable impact of the project. These measures appear to be limited to the preservation of cold-water flows from three tributaries to the Rogue, the Kosten and Hilbrand Drains and Hickory Creek. Two of these are not within the project boundaries and Kosten Drain will be channeled without removing the existing shade cover. The proposed tree plantings along Danials Creek and Kosten Drain and the Rogue spoil banks will require a considerable period of time before any meaningful stream shading is provided.

We feel the following points should be addressed in the statement.

1. What is the immediate impact of stream channeling and the placement of structures on Rogue River temperature in and below the project area?
2. Are groundwaters or increased stream velocities expected to affect stream temperatures?
3. Has the project design incorporated any measures other than tree plantings which may

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

lower stream temperatures in the area downstream from the project boundaries? For example would siphon type outlets be utilized in control structures and at Ransom Lake?

The utilization of such bottom drawing siphon outlets to reduce water temperatures is worthy of careful consideration."

Response: Page II-92, paragraph two indicates that tree plantings in time will provide shade for streamwater cooling. There is no change nor impact of channel work and structures on stream temperature. Groundwaters or stream velocities will not affect stream temperatures. Low flow channels will be established to preserve low flow characteristics and maintain cool water temperatures in addition to tree plantings. This is described on pages II-17, 24, and 25. Due to the physical characteristics of Ransom Lake bottom drawing siphons are not feasible.

7. **Comment:** "It is stated the qualitative bioassay of benthic fauna was conducted in July. The survey results indicated a low habitat diversity and water quality in the project area according to the low numbers of sensitive organisms recovered. We would point out that July is a poor time to conduct such a survey because the major portion of such organisms have emerged, and consequently their larvae are not abundant at this time of the year. This information should be included in the statement."

Response: Paragraph two, page II-43 has been rewritten. We agree that July is not the best month for this type of bioassay. Nevertheless, we believe the results help substantiate our conclusion as to habitat diversity and water quality since several pollution sensitive organisms were present in downstream sample stations.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

8. Comment: "It is also stated that the water chemistry of the Lower Rogue River (Table 15) indicates slight to moderate contamination by municipal sewage. However, the levels of heavy metals, pH, and fecal coliforms found in the table are very near normal background levels. This should be further clarified in the text."

Response: Paragraph three, page II-47 has been modified to delete, "to moderate."

9. Comment: "It appears that there could be an impact on flood stages downstream due to the proposed drainage changes and diversions in the upstream reaches. Flood waters could reach downstream areas in a shorter time span resulting in higher peak flows. The table on page II-86 indicates that flood events at a 10-100 year frequency will have lower peak discharges. This should be explained in more detail in the text."

Response: Data indicated on pages II-85 and 35 are based on detailed flood routings of without project and with project conditions. Pumping an increased drainage area of about 1.3 square miles as well as the way planned structural measures function together result in decreased downstream peak flows for the infrequent events.

10. Comment: "The Rogue River Natural River zone is referred to on Page II-93. We suggest this segment be expanded to explain that the Rogue River from 20 Mile Road downstream, including some tributaries has been designated as a natural river under Act 231, P. A. 1970. The plan calls for a new building setback of 150 feet and a 50 foot natural vegetation strip to provide an esthetic screen, a filter for runoff waters, nutrient absorption, and protection against bank erosion. It is stated in this paragraph that development will be limited where risk of flooding exists. However, section 16.5.6 of the amendment to the Plainfield township Zoning Ordinance specifically prohibits cutting, filling or building in a floodplain. This should be cited in the EIS."

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

Response: Narrative on pages II-13 and 93 incorporates changes as suggested by your letter of January 31, 1975 and appears to respond to this comment.

11. Comment: "Under alternative 2 on page 100, it appears that a Rice Lake flood storage basin would have an approximate surface size of 600 acres and would be capable of storing a 25-year flood. We feel that the discussion of this alternation and alternative 5, the reflooding of Rice Lake, should be expanded to delineate further their advantages and disadvantages to the citizens of Newaygo County and Michigan."

Response: These alternatives were determined to be not feasible by earlier DNR studies. We feel sufficient discussions are given in the narrative.

12. Comment: "The 1968 chemical reclamation treatment of the Rogue is mentioned on Page II-76. We suggest that the \$50,000 stream improvement program carried out by the DNR in 1972-73 and which will continue on a maintenance basis is worthy of mention. Also, the DNR chemical reclamation program to provide a trout fishery is an ongoing and continuing program. The remainder of our comments will be addressed to page and paragraph of the text."

Response: This part of the text is considering problems--specifically recreation problems and demands. This comment is not relevant to the proposed project.

13. Comment: "Page II-17, paragraph 3
It should be mentioned that to minimize erosion rock riprap will be provided on all corners and in areas where major springs and tiles emerge from streambanks."

Response: This is not necessarily true nor is there any intention of placing rock riprap on all corners. Seepage problems will be handled by toe drains or tile interceptors as stated in the EIS, page II-17, paragraph 3.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

14. Comment: "Page II-20, paragraph 4
It is stated that undesirable vegetation growth will be controlled by mowing and/or spraying. It should be stated which plants are considered undesirable and for what reason. Willow and other types of brush may be undesirable due to channel clogging problems, but would provide bank stabilization where this is the primary interest."

Response: This comment appears to refer to page II-26 rather than II-20. This paragraph is concerned with "functioning of the multiple-purpose channel work," not bank stabilization. Therefore, channel clogging is of primary concern and any brushy vegetation is undesirable. Designed depth and size must be maintained for flow capacity of the channel.

15. Comment: "Page II-23, Table 7
We suggest that information as to what period or base the cost figures were derived from be included in the EIS."

Response: Tables 1-6 on pages I-33 through I-44 indicate the price base is 1974. A footnote has been added to Table 7 to further clarify this information.

16. Comment: "Page II-44, Table 12
Water quality classifications are incorrect on:

	<u>Text Class.</u>	<u>Correct Class.</u>
1. Nash Creek	C	W ²
2. Ball Creek	C	W ²
3. Walter Creek	C	W ²
4. Post Creek	W ¹	C
5. Kosten Drain	C	W ²
6. Hickory Creek	W ¹	W ²

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

Response: The changes noted have been made with the exception of Walter Creek where the lower half is a coldwater stream.

17. Comment: "Page II-43, paragraph 1
The statements concerning stream classification are incorrect. There are fifteen tributaries to the Rogue River in Kent County which are classified as second quality warmwater. An additional ten tributaries are classified as top quality coldwater plus one (Post Creek) classified as second quality coldwater."

Response: The text on page II-43 has been changed to reflect this information.

18. Comment: "Page II-43, paragraph 2
We agree with the conclusion drawn from the bioassay of benthic fauna, but we do not feel this limited survey is adequate to substantiate those conclusions."

Response: Paragraph has been rewritten drawing together information from the planned project section of EIS. Results of bioassay, bottom substrates of muck and sand and near stagnate water flows substantiates our conclusions.

19. Comment: "Page II-59, Table 20
The following corrections should be made:
1. Hickory Creek - this is a second quality warmwater tributary--not a coldwater tributary as stated.
 2. Spring Creek and Cedar Creek - delete rainbow trout. There are no self-sustaining rainbow trout populations in these waters.
 3. Little Cedar Creek - this stream is classified as top quality coldwater tributary rather than second quality coldwater as stated."

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

Response: Changes have been made in the table to reflect this information.

20. Comment: "Page II-61, Recreational Resources
The comments should be expanded concerning public stream access within the watershed. In addition to the approximate 5,600 acres within the State Game Area, the MDNR has purchased four additional parcels on the Rogue River in Kent County and one on Stegeman Creek for habitat protection and stream access. On the basis of this amount of public ownership within the watershed, we do not feel stream access is confined. Location and acreage of this public frontage is listed below.

<u>T</u>	<u>R</u>	<u>Sec.</u>	<u>Acreage</u>
9N	11W	30	43
9N	11W	23	80
9N	11W	23	16 (Stegeman Creek)
9N	11W	22	74
8N	11W	22, 23	<u>12</u> 225 acres

Response: Stegeman Creek has been added to the last sentence and the word confined omitted.

21. Comment: "Page II-62, paragraph 1
The correct size of the Rogue River State Game Area is 5,600 acres. Also, we know of only one park in the watershed, that being at Long Lake."

Response: The size of the Game Area has been corrected. Although Long Lake is the only park in the watershed, the intent was to show the resources of the immediate area since recreation area users do not go by watershed boundaries. The EIS on page 62 has been modified to indicate the data is of a wider range than just the watershed.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES (continued)

22. Comment: "Page II-83, paragraph 2
It is stated that sediment buildup behind the two downstream dams will be reduced by 47 percent. It should be stated that one of these dams, the Childsdale Dam, is expected to be removed during 1975 and 1976."

Response: The 47 percent reduction will occur to the dams as long as they exist. Since they are not part of the project and do not affect the project in any way, it makes little difference whether the dam might be removed or not.

23. Comment: "Page II-85, structural measures, paragraph 1
It is stated that the average annual acres flooded will be reduced by 92 percent. Over what period of time would this occur."

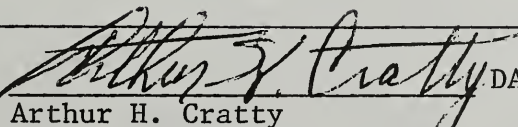
Response: This will occur over the 50-year life of the project and could be longer if maintenance is continued. The sentence has been expanded to indicate the project life.

24. Comment: "Page II-93, paragraph 4
Considering that the people of the county have contributed \$1 million to the project, and the general public another \$1.8 million has there been any consideration of public hunting and fishing along the channels after they are stabilized?"

Response: Yes, however, it is not a purpose of the project to acquire and provide public ingress and egress. Project costs would be much greater. An additional sponsor would be needed since the Michigan Drain Code prevents the Rogue River Inter-County Drainage Board from financing this purpose.

LIST OF APPENDICES

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APPENDIX	D	Definitions of Land Treatment Practices
APPENDIX	E	Description of Soil Capability Classes
APPENDIX	F	Michigan Water Quality Criteria - Temperature
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APPROVED BY
Arthur H. Cratty
State Conservationist

DATE

July 30, 1975

THE UNIVERSITY OF CHICAGO

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APPENDICES

APPENDIX A

COMPARISON OF BENEFITS AND COSTS

Rogue River Watershed, Michigan

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS ^{1/}					Total	Average Annual Cost ^{2/}	Benefit Cost Ratio
	Flood Damage Reduction	Flood Prevention More Intensive Land Use	Changed Land Use	Drainage	Secondary			
All Structural Measures	69,975 ^{3/}	223,900	-0-	223,900	108,990	626,765	121,325	
All Non-Structural Measures: Flood Plain Management	12,100 ^{4/}	-0-	-0-	-0-	1,370	13,470	3,565	
TOTAL	82,075	223,900	-0-	223,900	110,360	640,235	124,890	5.1: 1
Project Administration	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	13,820	xxxx
GRAND TOTAL	82,075 ^{5/}	223,900	-0-	223,900	110,360	640,235	138,710	4.6: 1

^{1/} Current Normalized Prices, WRC 1974.

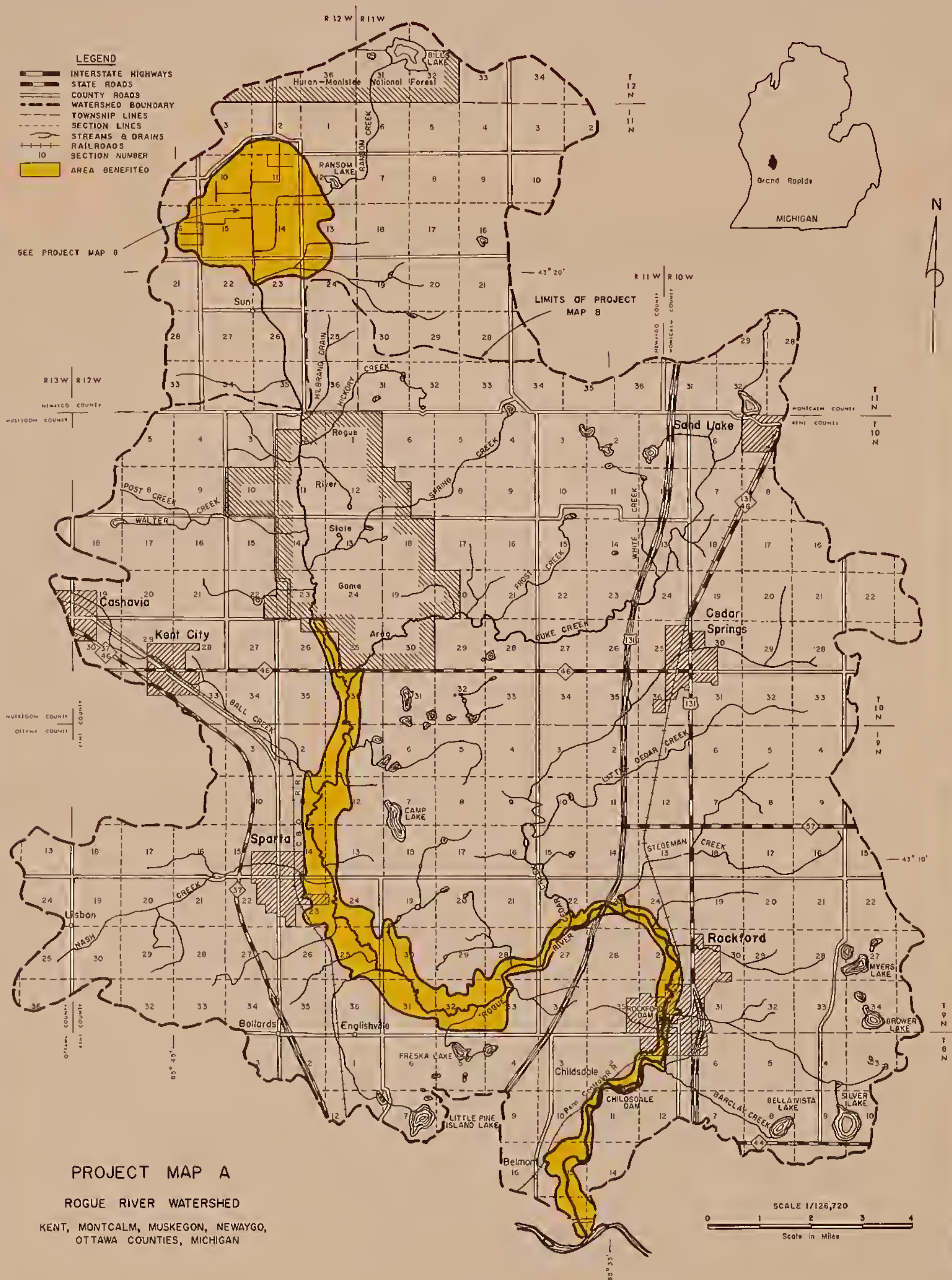
^{2/} Includes project installation costs amortized at 5 7/8 percent interest for 50 years plus cost of operation and maintenance.

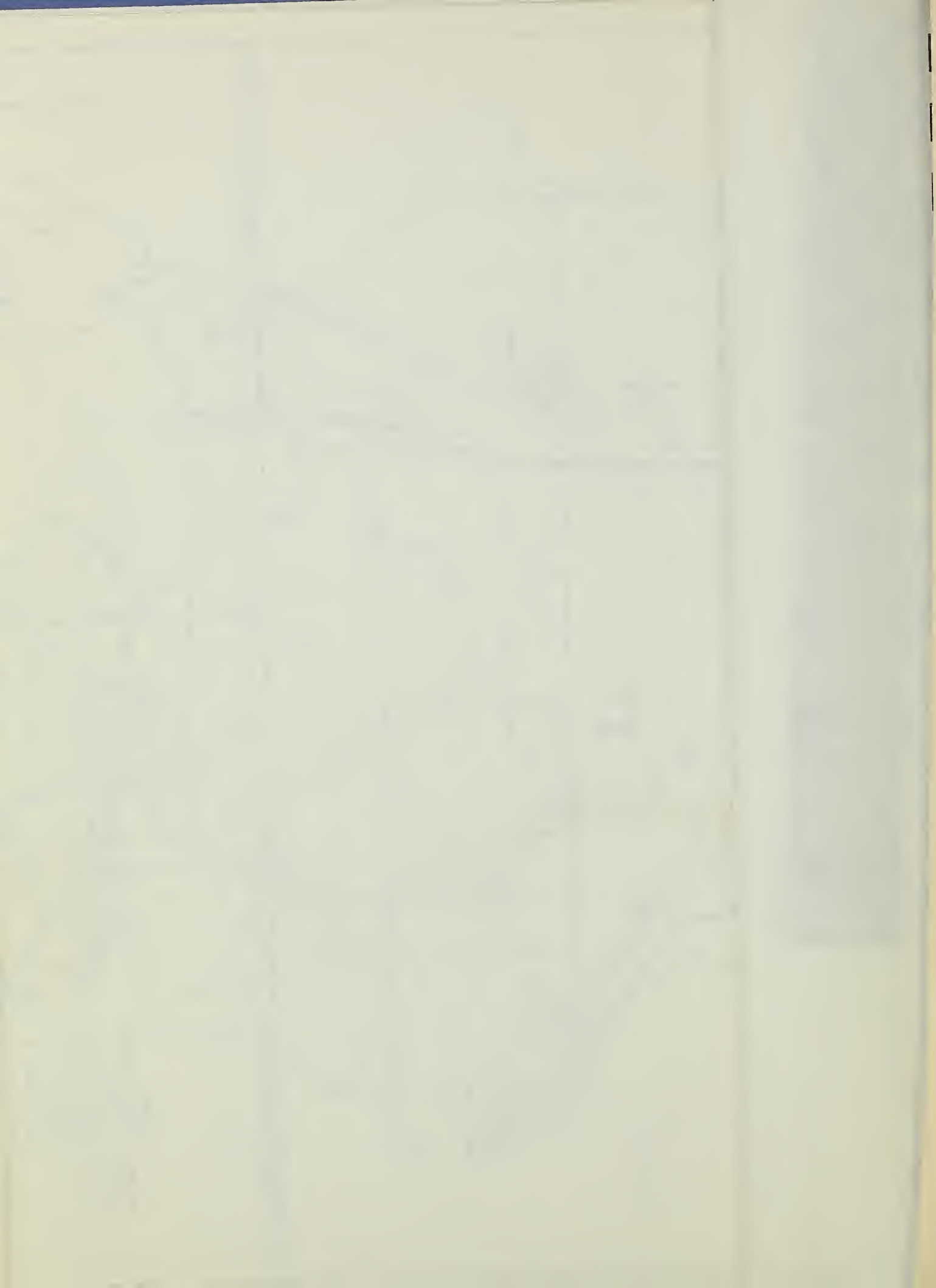
^{3/} This category includes \$2,860 in annual sediment benefits due to reduced channel cleanout costs.

^{4/} Annual reduction in flood damages to future homes as shown in Table 5.

^{5/} In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$640 annually.

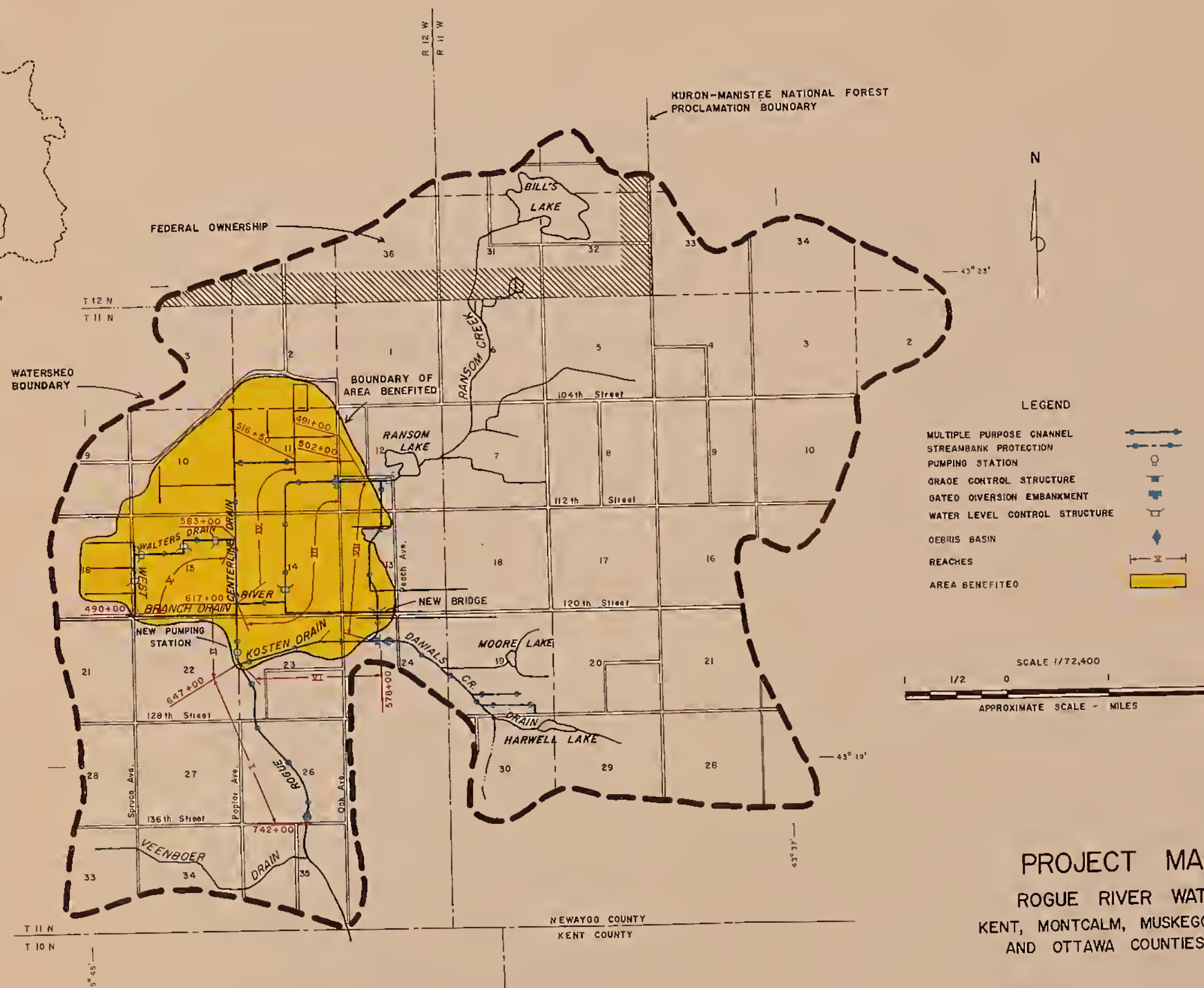
December 1974.







LOCATION MAP



PROJECT MAP B
 ROGUE RIVER WATERSHED
 KENT, MONTCALM, MUSKEGON, NEWAYGO,
 AND OTTAWA COUNTIES, MICHIGAN

Michigan Department of Natural Resources, *Preliminary Natural Rivers Plan--Rogue River (Kent County)*, DNR-Office of Planning Services, Lansing, Michigan, 1973, 24 pp.

Michigan Department of State, *Michigan Centennial Farms Directory*, Revised Edition of Continuing Inventories, Michigan History Division, Lansing, Michigan, 1974, 54 pp.

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Michigan Department of State, unpublished correspondence from Mr. Donald Weston to Mr. Robert Fellows stating impact of the proposed project on local archeological sites, Michigan History Division, Lansing, Michigan, July 29, 1974.

Strommen, N. D., *Climate of Michigan by Stations*, Second Revised Edition, Michigan Weather Service, 1974, 120 pp.

U. S. Department of Agriculture, *Agricultural Statistics*, Annual Editions 1965-1973, GPO, Washington, D. C.

U. S. Department of Agriculture, *Engineering Handbook*, Section 4-Hydrology, Section 5-Hydraulics and Section 16-Drainage of Agricultural Land, Soil Conservation Service, Washington, D.C., 1960, (approximately-date not listed).

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U. S. Department of Agriculture, *Federal Register*, Volume 39, Number 107, Part III, GPO, Washington, D.C., June 3, 1974, pp 19646-19660.

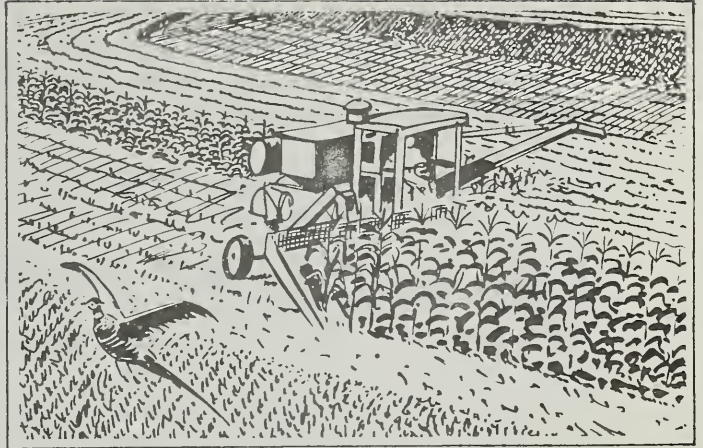
U. S. Department of Agriculture, "Land Capability Classification," *Agricultural Handbook No. 210*, Soil Conservation Service, Washington, D.C., 1961, 21 pp.

U. S. Department of Agriculture, *Michigan Conservation Needs Inventory*, Revised Edition, USDA, Soil Conservation Service, East Lansing, Michigan, 1968, 123 pp.

- U. S. Department of Agriculture, *Soil Survey of Kent County, Michigan*, No. 10, Series 1926, Bureau of Chemistry and Soils, Washington, D.C., 1926. (Copies may now be obtained from the USDA, Soil Conservation Service, East Lansing, Michigan). 37 pp.
- U. S. Department of Agriculture, *Soil Survey of Newaygo County, Michigan*, No. 9, Series 1939, Agricultural Research Administration, Washington, D.C., 1951. (Copies may now be obtained from the USDA Soil Conservation Service, East Lansing, Michigan). 68 pp.
- U. S. Department of Agriculture, *Watershed Protection Handbook*, Revised Edition, Soil Conservation Service, Washington, D.C., September, 1974.
- U. S. Department of Commerce, *Agricultural Price Standards for Water and Related Land Resources Planning*, U. S. Water Resources Council, Washington, D.C., 1974, 29 pp.
- U. S. Department of Commerce, *1969 Census of Agriculture*, Volume 1-Area Reports, Part 13-Michigan, Section 2-County Data, Bureau of the Census, Washington, D.C., 1971.
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- U. S. Department of Commerce, *et.al.*, *OBERS Projections of Regional Activity in the United States*, Volumes 1-6, U. S. Water Resources Council, Washington, D.C., 1972.
- U. S. Department of the Interior, *Grand River Basin, Comprehensive Water Resources Study*, Volume VII, Appendices J, K, and L, Bureau of Outdoor Recreation, Ann Arbor, Michigan, 1970, 380 pp.
- Williams and Works, *Kent County, Michigan, Comprehensive Area-Wide Water and Sewer Plan*, Kent County Planning Commission, Grand Rapids, Michigan, 1972, 175 pp.
- U. S. Department of the Interior, *Wetlands of the United States*, Circular 39, Fish and Wildlife Service, Washington, D.C., 1956, 67 pp.

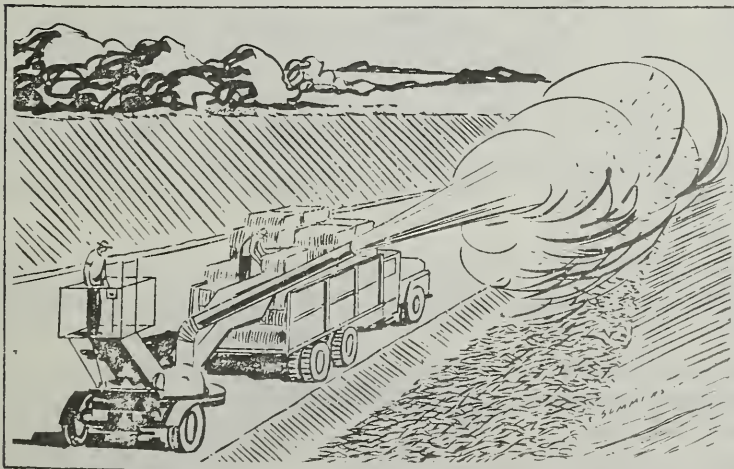
APPENDIX D DEFINITIONS OF LAND TREATMENT PRACTICES

Conservation Cropping System - Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops. The purpose is to improve or maintain good physical condition of the soil; protect the soil during periods when erosion usually occurs; help control weeds, insects, and diseases; and meet the need and desire of farmers for an economic return. It is applicable on all cropland and on certain recreation and wildlife land.



Critical Area Planting - Planting vegetation such as trees, shrubs, vines, grasses, or legumes on critical areas. (Does not include tree planting mainly for wood products). The purpose is to stabilize the soil; reduce damage from sediment and runoff to downstream areas; improve wildlife habitat; and enhance natural beauty. It is applicable on sediment-producing, highly erodible or

severely eroded areas, such as dams, dikes, mine spoil, levees, cuts, fills, surface-mined areas, and denuded or gullied areas where vegetation is difficult to establish with usual seeding or planting methods.



Crop Residue Use - Using plant residues to protect cultivated fields during critical erosion periods. The purpose is to conserve moisture; increase infiltration; reduce soil loss; and improve soil tilth. It is applicable on land where adequate crop residues are produced.

Drain - A conduit, such as tile, pipe, or tubing, installed beneath the ground surface and which collects and/or conveys drainage water. A drain may serve one or more of the following purposes:

1. Improve agricultural production by lowering the water table.
2. Intercept and prevent water movement into a wet area.
3. Relieve artesian pressures.
4. Remove surface runoff.
5. Facilitate leaching of saline and alkali soils.
6. Serve as an outlet for other drains.
7. Provide ground water regulation and control for sub-irrigated areas.

Drains are used in areas having a high water table where benefits of lowering or controlling groundwater or surface runoff justify the installation of such a system.

Drainage Field Ditch - A graded ditch for collecting excess water within a field. This does not include Drainage Main or Lateral, or Grassed Waterway or Outlet. Applicable sites are flat or nearly flat lands that:

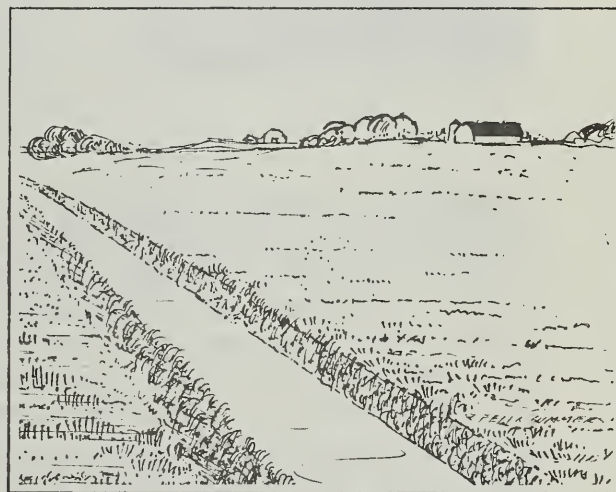


1. Have soils of low permeability or shallowness over barriers, such as rock or clay, which hold or prevent ready percolation of water to a deep stratum.
2. Have surface depressions or barriers which trap rainfall.
3. Have insufficient land slope for ready movement of runoff across the surface.
4. Receive excess runoff or seepage from uplands.
5. Require removal of excess irrigation water.
6. Require control of the groundwater table.
7. Have adequate outlets available for disposal of drainage water by gravity flow or pumping.

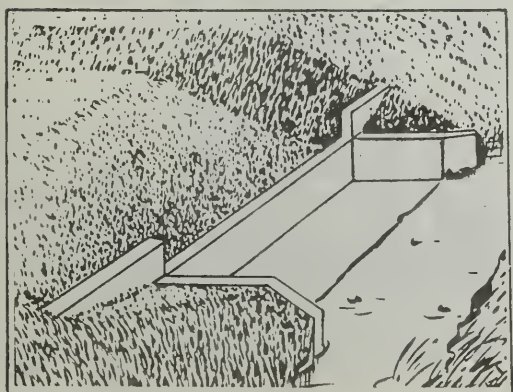
Drainage field ditches are installed to:

1. Drain surface depressions.
2. Collect or intercept excess surface water such as sheet flow from natural and graded land surfaces or channel flow from furrows for removal to an outlet.
3. Collect or intercept excess subsurface water for removal to an outlet.

Drainage Main or Lateral - An open drainage ditch constructed to a designated size and grade. Does not include Drainage Field Ditch. The purpose of mains and laterals is to dispose of excess surface or subsurface water, intercept groundwater, or to control groundwater levels; to provide for leaching of saline or alkali soils; or a combination of these objectives.



Grade Stabilization Structure - A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include straight pipe overflow structures used in drainage and irrigation systems for water control). Grade stabilization structures are installed to stabilize the grade in natural or artificial channels, prevent the formation or advance of gullies, and reduce environmental and pollution hazards. These structures apply where the concentration and flow velocity of water are such that structures are required to stabilize the grade in channels or to control gully erosion. Special attention will be given to maintaining or improving habitat for fish and wildlife, where applicable.

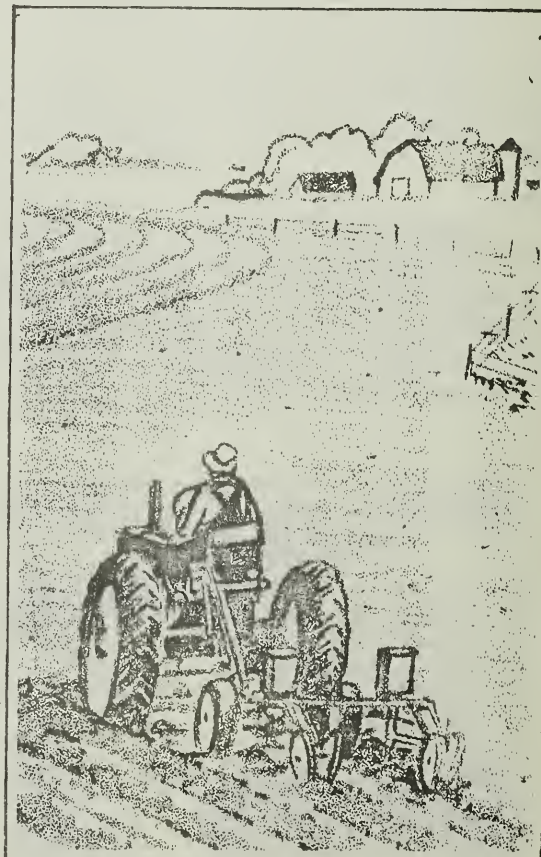




Grassed Waterway or Outlet - A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose runoff from a field, diversion, terrace, or other structure. The purpose is to prevent excessive soil loss and formation of gullies. It is applicable where concentrated runoff must be disposed of at safe velocities.

Hydrologic Cultural Operations - These operations improve forest hydrologic conditions through increased development of litter and humus and maintenance of adequate vegetative cover. These objectives are reached by favoring the establishment and development of desirable species and maintaining stand and stocking conditions favorable to rapid growth and production of maximum amounts of litter and humus. Hydrologic cultural operations include thinnings, weeding, release, salvage and harvest cuts.

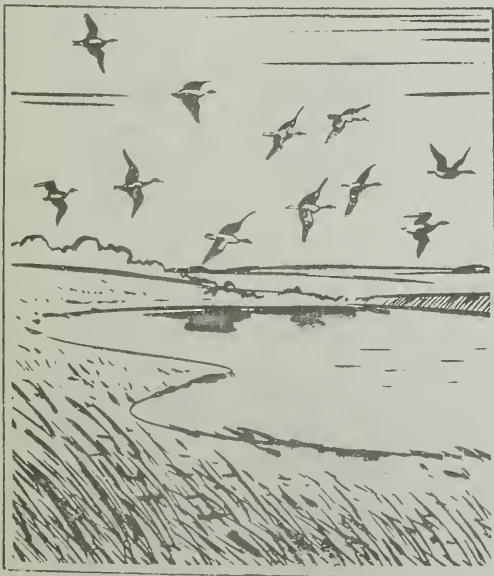
Minimum Tillage - Limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage. The purpose is to retard deterioration of soil structure; reduce soil compaction and formation of tillage pans; and to improve soil aeration, permeability, and tilth. It is applicable on all cropland and on certain recreation and wildlife land.



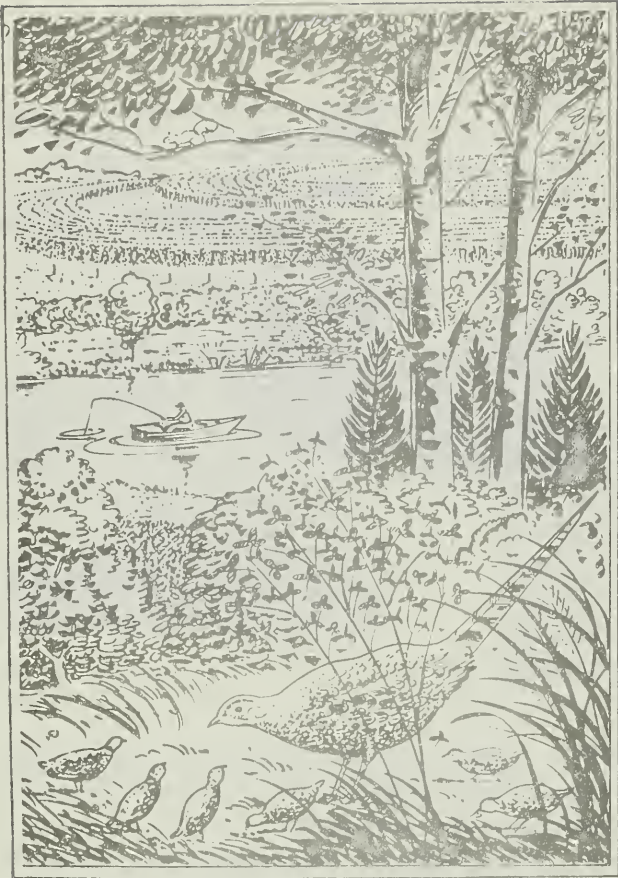
Pasture and Hayland Management - Proper treatment and use of pastureland or hayland. The purpose is to prolong life of desirable forage species; to maintain or improve the quality and quantity of forage; and to protect the soil, and reduce water loss. It is applicable on all pastureland or hayland.



Pasture and Hayland Planting - Establishing and re-establishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. The purposes are to reduce erosion, to produce high quality forage, and to adjust land use. It is applicable on existing pasture and hayland or on land that is converted from other uses.



Pond - A water impoundment made by constructing a dam or embankment, or by excavating a pit or "dugout." Ponds are constructed to provide water for livestock, fish and wildlife, recreation, fire control, crop and orchard spraying, and other related uses.



Tree Planting - Planting tree seedlings or cuttings. The purposes are to establish or reinforce a stand of trees to conserve soil and moisture; beautify an area; protect a watershed; or produce wood crops. It is applicable in open fields, in understocked woodland, beneath less desirable tree species, or on other areas suitable for producing wood crops; where erosion control or watershed protection is needed; where greater natural beauty is wanted; or where a combination of these is desired.

Wildlife Upland Habitat Management - Retaining, creating, or managing wildlife habitat other than wetland. The purpose is to keep, make, or improve habitat for desired kinds of wildlife. It is applicable on sites (other than wetland) that are suitable for the kinds of wildlife food or cover plants that are needed.

APPENDIX E

DESCRIPTION OF SOIL CAPABILITY CLASSES

Class I—Soils in class I have few limitations that restrict their use.

Soils in this class are suited to a wide range of plants and may be used safely for cultivated crops, pasture, range, woodland, and wildlife. The soils are nearly level and erosion hazard (wind or water) is low. They are deep, generally well drained, and easily worked. They hold water well and are either fairly well supplied with plant nutrients or highly responsive to inputs of fertilizer.

The soils in class I are not subject to damaging overflow. They are productive and suited to intensive cropping. The local climate must be favorable for growing many of the common field crops.

Class II—Soils in class II have some limitations that reduce the choice of plants or require moderate conservation practices.

Soils in class II require careful soil management, including conservation practices, to prevent deterioration or to improve air and water relations when the soils are cultivated. The limitations are few and the practices are easy to apply. The soils may be used for cultivated crops, pasture, range woodland, or wildlife food and cover.

Limitations of soils in class II may include singly or in combination the effects of (1) gentle slopes, (2) moderate susceptibility to wind or water erosion or moderate adverse effects of past erosion, (3) less than ideal soil depth, (4) somewhat unfavorable soil structure and workability, (5) slight to moderate salinity or sodium easily corrected but likely to recur, (6) occasional damaging overflow, (7) wetness correctable by drainage but existing permanently as a moderate limitation, and (8) slight climatic limitations on soil use and management.

Class III—Soils in class III have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Soils in class III have more restrictions than those in class II and when used for cultivated crops the conservation practices are usually more difficult to apply and to maintain. They may be used for cultivated crops, pasture, woodland, range, or wildlife food and cover.

Limitations of soils in class III restrict the amount of clean cultivation; timing of planting, tillage, and harvesting; choice of crops; or some combination of these limitations. The limitations may result from the effects of one or more of the following: (1) Moderately steep slopes; (2) high susceptibility to water or wind erosion or severe adverse effects of past erosion; (3) frequent overflow accompanied by some crop damage; (4) very slow permeability of the subsoil; (5) wetness or some continuing waterlogging after drainage; (6) shallow depths to bedrock, hardpan, fragipan, or claypan that limit the rooting zone and the water storage; (7) low moisture-holding capacity; (8) low fertility not easily corrected; (9) moderate salinity or sodium; or (10) moderate climatic limitations.

Class IV—Soils in class IV have very severe limitations that restrict the choice of plants, require very careful management, or both.

The restrictions in use for soils in class IV are greater than those in class III and the choice of plants is more limited. When these soils are cultivated, more careful management is required and conservation practices are more difficult to apply and maintain. Soils in class IV may be used for crops, pasture, woodland, range, or wildlife food and cover.

Soils in class IV may be well suited to only two or three of the common crops or the harvest produced may be low in relation to inputs over a long period of time. Use for cultivated crops is limited as a result of the effects of one or more permanent features such as (1) steep slopes, (2) severe susceptibility to water or wind erosion, (3) severe effects of past erosion, (4) shallow soils, (5) low moisture-holding capacity, (6) frequent overflows accompanied by severe crop damage, (7) excessive wetness with continuing hazard of waterlogging after drainage, (8) severe salinity or sodium, or (9) moderately adverse climate.

Many sloping soils in class IV in humid areas are suited to occasional but not regular cultivation. Some of the poorly drained, nearly level soils placed in class IV are not subject to erosion but are poorly suited to intertilled crops because of the time required for the soil to dry out in the spring and because of low productivity for cultivated crops. Some soils in class IV are well suited to one or more of the special crops, such as fruits and ornamental trees and shrubs, but this suitability itself is not sufficient to place a soil in class IV.

Class V—Soils in class V have little or no erosion hazard but have other limitations impractical to remove that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Soils in class V have limitations that restrict the kind of plants that can be grown and that prevent normal tillage of cultivated crops. They are nearly level but some are wet, are frequently overflowed by streams, are stony, have climatic limitations, or have some combination of these limitations. Examples of class V are (1) soils of the bottom lands subject to frequent overflow that prevents the normal production of cultivated crops, (2) nearly level soils with a growing season that prevents the normal production of cultivated crops, (3) level or nearly level stony or rocky soils, and (4) ponded areas where drainage for cultivated crops is not feasible but where soils are suitable for grasses or trees. Because of these limitations cultivation of the common crops is not feasible but pastures can be improved and benefits from proper management can be expected.

Class VI—Soils in class VI have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Physical conditions of soils placed in class VI are such that it is practical to apply range or pasture improvements, if needed, such as seeding, liming, fertilizing, and water control with contour furrows, drainage ditches, diversions, or water spreaders. Soils in class VI have continuing limitations that cannot be corrected, such as (1) steep slope, (2) severe erosion hazard, (3) effects of past erosion, (4) stoniness, (5) shallow rooting zone, (6) excessive wetness or overflow, (7) low moisture capacity, (8) salinity or sodium, or (9) severe climate. Because of one or more of these limitations these soils are not generally suited to cultivated crops. But they may be used for pasture, range, woodland, or wildlife cover or for some combination of these.

Class VII—Soils in class VII have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Physical conditions of soils in class VII are such that it is impractical to apply such pasture or range improvements as seeding, liming, fertilizing, and water control with contour furrows, ditches, diversions, or water spreaders. Soil restrictions are more severe than those in class VI because of one or more continuing limitations that cannot be corrected, such as (1) very steep slopes, (2) erosion, (3) shallow soil, (4) stones, (5) wet soil, (6) salts or sodium, (7) unfavorable climate, or (8) other limitations that make them unsuited to common cultivated crops. They can be used safely for grazing or woodland or wildlife food and cover or for some combination of these under proper management.

Depending upon the soil characteristics and local climate, soils in this class may be well or poorly suited to woodland. They are not suited to any of the common cultivated crops; in unusual instances, some soils in this class may be used for special crops under unusual management practices. Some areas of class VII may need seeding or planting to protect the soil and to prevent damage to adjoining areas.

Class VIII—Soils and landforms in class VIII have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply or to esthetic purposes.

Soils and landforms in class VIII cannot be expected to return significant on-site benefits from management for crops, grasses, or trees, although benefits from wildlife use, watershed protection, or recreation may be possible.

Limitations that cannot be corrected may result from the effects of one or more of the following: (1) Erosion or erosion hazard, (2) severe climate, (3) wet soil, (4) stones, (5) low moisture capacity, and (6) salinity or sodium.

Badlands, rock outcrop, sandy beaches, river wash, mine tailings, and other nearly barren lands are included in class VIII. It may be necessary to give protection and management for plant growth to soils and landforms in class VIII in order to protect other more valuable soils, to control water, or for wildlife or esthetic reasons.

APPENDIX F

Michigan Water Quality Criteria for Rivers and Streams - Temperature

- I. Rivers and streams naturally capable of supporting intolerant fish, coldwater species shall not receive a heat load which would warm the receiving water:

More than 2 degrees F above the existing natural temperature at the edge of the mixing zone nor:

To temperatures higher than those listed below at the edge of the mixing zone:

J	F	M	A	M	J	J	A	S	O	N	D
38	38	43	54	63	68	68	68	63	56	48	40

- II. Rivers and streams naturally capable of supporting intolerant fish, warmwater species shall not receive a heat load which would warm the receiving water:

More than 5 degrees F above the existing natural temperature at the edge of the mixing zone nor:

To temperatures higher than those listed below at the edge of the mixing zone:

Rivers and streams south of a line between Bay City, Midland, Alma and North Muskegon, except the St. Joseph River:

J	F	M	A	M	J	J	A	S	O	N	D
41	40	50	63	76	84	85	85	79	68	55	43

- III. Non-trout rivers and streams that serve as principal migratory routes for anadromous salmonids shall not receive a heat load which would:

During periods of salmonid migration raise the receiving water temperature more than 5 degrees F above the existing natural temperature at the edge of the mixing zone nor:

Warm the receiving water to a temperature of more than 70 degrees F at the edge of the mixing zone.

IV - Stream Type and Quality

Top Quality Trout Mainstream - Contain good self-sustaining trout or salmon populations and are readily fishable, typically over 15 feet wide.

Top Quality Trout Feeder Stream - Contain good self-sustaining trout or salmon populations, but difficult to fish due to small size, typically less than 15 feet wide.

Second Quality Trout Mainstream - Contain significant trout or salmon populations, but these populations are appreciably limited by such factors as inadequate natural reproduction, competition, siltation, or pollution. Readily fishable, typically 15 feet wide.

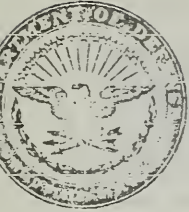
Second Quality Trout Feeder Stream - Contain significant trout or salmon populations, but these populations are appreciably limited by such factors as inadequate natural reproduction, competition, siltation, or pollution. Difficult to fish because of small size, typically less than 15 feet wide.

Top Quality Warmwater Mainstream - Contain good self-sustaining populations of warmwater game fish and are readily fishable, typically over 15 feet wide.

Top Quality Warmwater Feeder Stream - Contain good self-sustaining populations of warmwater game fish, but are difficult to fish because of small size, typically less than 15 feet wide.

Second Quality Warmwater Mainstream - Contain significant populations of warmwater fish, but game fish populations are appreciably limited by such factors as pollution, competition, or inadequate natural reproduction. Readily fishable, typically over 15 feet wide.

Second Quality Warmwater Feeder Stream - Contain significant populations of warmwater fish, but game fish populations are appreciably limited by such factors as pollution, competition, or inadequate natural reproduction. Difficult to fish because of small size, typically less than 15 feet wide.



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

15 MAY 1975

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the views of the Secretary of the Army were requested for the Watershed Work Plan and Draft Environmental Impact Statement for Rogue River Watershed, Newaygo, Kent, Montcalm, Muskegon and Ottawa Counties, Michigan.

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this Department.

The draft environmental impact statement is considered to be satisfactory.

Sincerely,

A handwritten signature in cursive script, reading "Charles R. Ford", is positioned above the typed name.

Charles R. Ford
Deputy Assistant Secretary of the Army
(Civil Works)



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

REGION V

300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

OFFICE OF
THE REGIONAL DIRECTOR

May 2, 1975

Arther H. Cratty
State Conservationist
Soil Conservation Service
Department of Agriculture
1405 South Harrison Rd., 101
East Lansing, Michigan 48823

RE: Draft Environmental Impact Statement
Rogue River Watershed, Michigan

Dear Mr. Cratty:

We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Sincerely yours,

Robert A. Ford
Regional Environmental Officer

cc: Charles Custard
Warren Muir



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

• 2 • 1975

• Mr. Arthur H. Cratty
State Conservationist
Soil Conservation Service
1405 South Harrison Road
East Lansing, Michigan 48823

Dear Mr. Cratty:

This is in response to your letter of 26 March 1975 addressed to the Commandant, Coast Guard concerning a draft environmental impact statement for the Rogue River Watershed, Newaygo, Kent, Montcalm, Muskegan, and Ottawa Counties, Michigan.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W.E. Caldwell
W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief of Staff
Environment
By direct



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION V

230 SOUTH DEARBORN STREET

CHICAGO, ILLINOIS 60604

Mr. Arthur H. Cratty
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
Room 101, 1405 South Harrison Road
East Lansing, Michigan 48823

Dear Mr. Cratty:

We have completed our review of the Draft Environmental Impact Statement (EIS) and Draft Watershed Plan for the Rogue River Watershed Newaygo, Kent, Muskegon and Ottawa Counties, Michigan which was sent to us on March 26, 1975. Our major environmental concerns with the implementation of this proposal are the impacts of dredging and channelizing of streams in the watershed. Additional information should be provided on the quantity to be dredged, the pollutional status of these bottom sediments, the stability of the channel banks, the effects on Rockford's water supply and the effects of flooding downstream from the Rice Lake area. The following comments are for your consideration in preparing the Final EIS.

The project description indicates there are 11.6 miles of channel dredging and improvement planned for several drains within the watershed. Additional information should be provided in the Final EIS on the quantity of material to be dredged, the new depths of the channel, the pollutional status of the materials dredged and the stability of this material for bank construction. Since there are high concentrations of heavy metals in the water, there is the possibility that the concentrations of metals in the bottom sediments would exceed our criteria for unconfined disposal. Bottom sediments should be sampled and analyzed from several locations along the channels to be dredged. The criteria for bottom sediment analysis have been previously sent to your office. Furthermore, the EIS should discuss how dredging and channelizing the drains will reduce the damages from flooding and how this will change the peak periods of flooding downstream.

Due to the unstable nature of the soils within the watershed, the EIS should explain whether or not vegetation will permanently establish on a 2-1/2:1 side slope. Berm material placed on the sides of the channels may overload the bearing capacity of the in-place soils and induce additional sloughing. On pages 66 and 67, the EIS indicated that soils are unstable and do not provide sufficient root anchorage to prevent erosion. Thus, it would appear that the spoil banks may be unstable and may not support vegetation. This condition would cause the cold water fishery to be severely impacted due to increased turbidity.

Since there are 1.1 miles of new channel proposed for this project, a more detailed description of the area, impacts and purpose of the new channel should be provided.

Where channel work is planned, it should be conducted on the north and east sides of the channels. This would allow the existing vegetation to remain on the south and west sides of the channels, thus minimizing water exposure to the peak periods of sunlight. By minimizing the exposure to sunlight the channels should remain suitable as a cold water fishery. We also recommend that extensive plantings be made on the south and west sides of the channels.

As noted previously, heavy metals have been detected in the Rogue River. Since it is planned to dredge the City of Rockford's water supply reservoir, the EIS should discuss the anticipated impacts on the water supply - whether or not the water supply facility has adequate treatment to counteract additional pollutional loads resulting from the dredging operations. In addition, the EIS should explain whether or not the City of Rockford has experienced high levels of heavy metals previously and if it is anticipated that the concentrations of heavy metals will increase. As a result of the project, more intensive agricultural land use is forecasted, probably increasing the use of fertilizers and thus the nutrient runoff to the stream. Increased nutrients could adversely affect drinking water supplies. The Final EIS should provide the assurance that drinking water will meet the Interim Primary Drinking Water Standards published in the March 14, 1975 Federal Register.

One of the purposes of the project is to increase the drainage from the project area. However, the area where specialty crops are grown (formerly Rice Lake) appears to be dependent on a high water table creating mucky soils. The EIS should discuss how this area will be affected by the changes in the drainage patterns.

On page II-33, it was indicated that there were oil and gas wells within the watershed. Part of the project agreements should require proper maintenance of these facilities and the associated storage and transfer facilities to assure that oil is not introduced into the stream. All depleted wells should be capped and sealed and active wells, pipelines and storage facilities should be inspected for leaks and spills.

The flood plain study that will be conducted as part of the project should be described in greater detail in the Final EIS. Until the flood plain study is completed and permanent recommendations for the minimization of flood damages have been made, we recommend that there be no further development in the flood plain areas.

Alternative #5, Reflooding of Rice Lake described on page II-103 should be expanded to further discuss the beneficial and adverse impacts of implementing this alternative. Information which should be included are the effects on water quality, the effects on flood control and the value of fish and wildlife habitat created versus the loss of specialty farming.

The EIS indicated there would be a reduction in the sediment load from 4.5 tons/acre/year to 2.5 tons/acre/year through the cooperation of participating landowners. These options have been available to landowners for a number of years with limited acceptance. There should be greater discussion of how it is proposed to change this situation and what alternatives are available in the event a satisfactory degree of cooperation is not achieved. The EIS should also discuss what safeguards there are to assure that landowners carry out their share of the project once the channel improvements have been completed.

We appreciate the opportunity to review this Draft EIS. When the Final EIS is filed with the Council on Environmental Quality, please forward two copies to us. As indicated in the above discussion and in accordance with EPA procedures, we have classified our comments on the project as ER, Environmental Reservations, and rated the Draft EIS as Category 2, additional information necessary. The date and classification of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on other agency's proposals. If you have any questions concerning our comments please contact Mr. Gary A. Williams at 312-353-5756.

Sincerely yours,



Donald A. Wallgren
Chief,
Federal Activities Branch

Advisory Council
On Historic Preservation
1522 K Street N.W. Suite 430
Washington D.C. 20005

May 12, 1975

Mr. Arthur H. Cratty
State Conservationist
Soil Conservation Service
U. S. Department of Agriculture
Room 101, 1405 South Harrison Road
East Lansing, Michigan 48823

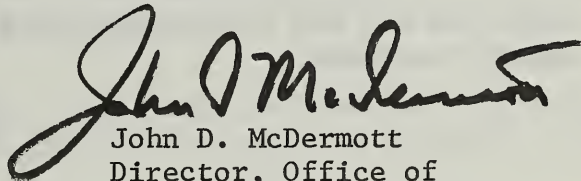
Dear Mr. Cratty:

This is in response to your request of March 26, 1975, for comments on the environmental statement for the Rogue River Watershed, Michigan.

Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears adequate regarding our area of expertise, and we have no further comment to make.

The Advisory Council appreciates the opportunity to review your undertaking.

Sincerely yours,



John D. McDermott
Director, Office of
Review and Compliance

STATE OF MICHIGAN

AGRICULTURE
COMMISSION

JOA PENZIEN
Chairman

H. THOMAS DEWHIRST
Vice-Chairman

CHARLES DONALDSON
Secretary

REBECCA TOMPKINS

DAVID D. DIEHL



WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF AGRICULTURE

LEWIS CASS BUILDING, LANSING, MICHIGAN 48913

B. DALE BALL, Director

April 29, 1975

Arthur G. Cratty, State Conservationist
Soil Conservation Service, USDA
1405 South Harrison Road
East Lansing, Michigan 48823

Re: Draft EIS for Rogue River Watershed Project

Dear Mr. Cratty:

The Draft Environmental Impact Statement for the Rogue River Watershed Project has been received and reviewed. We support the project, and we find the EIS to be basically complete in the assessment of its environmental effects.

Thank you for the opportunity to comment on the environmental impact statement.

Sincerely,

A handwritten signature in dark ink, reading "B. Dale Ball".

B. Dale Ball, Director

STATE OF MICHIGAN



WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926

HOWARD A. TANNER, Director

May 23, 1975

Mr. Arthur H. Cratty
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
Room 101, 1405 S. Harrison Rd.
East Lansing, Michigan 48823

Dear Mr. Cratty:

We have reviewed the draft environmental impact statement on the proposed Rogue River Watershed project. The document is well organized, clearly written, and in general represents a good job of describing the environmental impacts that will likely occur as a result of this project. We feel that the floodplain study in the lower Rogue River will be especially beneficial.

We do have a number of concerns regarding the plan and EIS, and find some areas of the statement that are in need of further clarification.

Under the heading Land Treatment Measures it is implied that some 9,710 acres of land will be treated by the implementation of this project. It should be made clear in the statement that these practices will only be carried out on lands where the landowner has requested assistance. It is our understanding that participation is voluntary, and agreements can be terminated by either the SCS or landowner at any time. Will the effectiveness of the overall plan be diminished without full cooperation and participation by the landowners involved? We suggest this be discussed in the EIS.

The total project costs, as broken down in Table 7, do not include the annual operation and maintenance costs estimated at \$12,390. We

suggest that this be identified as project maintenance and added to Table 7 on page II-28 as a foot-note, as a continuing part of the total project costs.

It is stated on page II-17 and continued on page II-18 that the debris basin will be cleaned out when construction is completed and will be maintained by the county. We urge that it be clearly spelled out in the statement that the debris basin will be frequently inspected and maintained as necessary during the course of construction. We further recommend that the immediate measures to stabilize the banks with permanent soil erosion control practices, as indicated in the statement, be inspected by the appropriate drainage official to insure their effectiveness. It is assumed that post project maintenance by the Inter-County Drainage Board will include clean outs of the debris basin as needed.

It should be indicated in the statement that it will be necessary for the Inter-County Drainage Board to obtain a permit under the Soil Erosion and Sedimentation Control Act of 1972 from the appropriate county enforcing agency. Careful consideration should be exercised to prevent downstream streambed and bank erosion which commonly results where dredging activity increases stream velocities.

The statement should include a discussion of provisions that would assure that the grassed berms, strips and slopes are not disturbed by farm equipment and livestock. For example, is cost-sharing available under any federal program for fencing off and stabilizing areas with gravel where cattle will have access to these streams? A more satisfactory method would be to supply livestock with well water to avoid damage to streambeds and banks. We suggest this matter be discussed in the statement.

We feel that the discussion of project impact on stream temperatures should be expanded. It is frequently mentioned in the statement that the protection of temperatures in the project area is a favorable impact of the project. These measures appear to be limited to the preservation of coldwater flows from three tributaries to the Rogue, the Kosten and Hilbrand Drains and Hickory Creek. Two of these are not within the project boundaries and Kosten Drain will be channeled without removing the existing shade cover. The proposed tree plantings along Danials Creek and Kosten Drain and the Rogue spoil banks will require a considerable period of time before any meaningful stream shading is provided.

We feel the following points should be addressed in the statement.

1. What is the immediate impact of stream channeling and the placement of structures on Rogue River temperature in and below the project area?
2. Are groundwaters or increased stream velocities expected to affect stream temperatures?
3. Has the project design incorporated any measures other than tree plantings which may lower stream temperatures in the area downstream from the project boundaries? For example would siphon type outlets be utilized in control structures and at Ransom Lake?

The utilization of such bottom drawing siphon outlets to reduce water temperatures is worthy of careful consideration.

It is stated the qualitative bioassay of benthic fauna was conducted in July. The survey results indicated a low habitat diversity and water quality in the project area according to the low numbers of sensitive organisms recovered. We would point out that July is a poor time to conduct such a survey because the major portion of such organisms have emerged, and consequently their larvae are not abundant at this time of the year. This information should be included in the statement.

It is also stated that the water chemistry of the Lower Rogue River (Table 15) indicates slight to moderate contamination by municipal sewage. However, the levels of heavy metals, pH, and fecal coliforms found in the table are very near normal background levels. This should be further clarified in the text.

It appears that there could be an impact on flood stages downstream due to the proposed drainage changes and diversions in the upstream reaches. Flood waters could reach downstream areas in a shorter time span resulting in higher peak flows. The table on page II-86 indicates that flood events at a 10-100 year frequency will have lower peak discharges. This should be explained in more detail in the text.

The Rogue River Natural River zone is referred to on Page II-93. We suggest this segment be expanded to explain that the Rogue River from 20 Mile Road downstream, including some tributaries has been

designated as a natural river under Act 231, P.A. 1970. The plan calls for a new building setback of 150 feet and a 50 foot natural vegetation strip to provide an esthetic screen, a filter for runoff waters, nutrient absorption, and protection against bank erosion. It is stated in this paragraph that development will be limited where risk of flooding exists. However section 16.5.6 of the amendment to the Plainfield township Zoning Ordinance specifically prohibits cutting, filling or building in a floodplain. This should be cited in the EIS.

Under alternative 2 on page 100, it appears that a Rice Lake flood storage basin would have an approximate surface size of 600 acres and would be capable of storing a 25-year flood. We feel that the discussion of this alternation and alternative 5, the reflooding of Rice Lake, should be expanded to delineate further their advantages and disadvantages to the citizens of Newaygo County and Michigan.

The 1968 chemical reclamation treatment of the Rogue is mentioned on Page II-76. We suggest that the \$50,000 stream improvement program carried out by the DNR in 1972-73 and which will continue on a maintenance basis is worthy of mention. Also, the DNR chemical reclamation program to provide a trout fishery is an ongoing and continuing program. The remainder of our comments will be addressed to page and paragraph of the text.

Page II-17, paragraph 3

It should be mentioned that to minimize erosion rock riprap will be provided on all corners and in areas where major springs and tiles emerge from streambanks.

Page II-20, paragraph 4

It is stated that undesirable vegetation growth will be controlled by mowing and/or spraying. It should be stated which plants are considered undesirable and for what reason. Willow and other types of brush may be undesirable due to channel clogging problems, but would provide bank stabilization where this is the primary interest.

Page II-28, Table 7

We suggest that information as to what period or base the cost figures were derived from be included in the EIS.

Page II-44, Table 12

Water quality classifications are incorrect on:

	<u>Text Class.</u>	<u>Correct Class.</u>
1. Nash Creek	C	W ²
2. Ball Creek	C	W ²
3. Walter Creek	C	W ²
4. Post Creek	W ¹	C
5. Kosten Drain	C	W ²
6. Hickory Creek	W ¹	W ²

Page II-43, paragraph 1

The statements concerning stream classification are incorrect. There are fifteen tributaries to the Rogue River in Kent County which are classified as second quality warmwater. An additional ten tributaries are classified as top quality coldwater plus one (Post Creek) classified as second quality coldwater.

Page II-43, paragraph 2

We agree with the conclusion drawn from the bioassay of benthic fauna, but we do not feel this limited survey is adequate to substantiate those conclusions.

Page II-59, Table 20

The following corrections should be made:

1. Hickory Creek - this is a second quality warmwater tributary - not a coldwater tributary as stated.
2. Spring Creek and Cedar Creek - delete rainbow trout. There are no self-sustaining rainbow trout populations in these waters.
3. Little Cedar Creek - this stream is classified as top quality coldwater tributary rather than second quality coldwater as stated.

Page II-61, Recreational Resources

The comments should be expanded concerning public stream access within the watershed. In addition to the approximate 5,600 acres within

the State Game Area, the MDNR has purchased four additional parcels on the Rogue River in Kent County and one on Stegeman Creek for habitat protection and stream access. On the basis of this amount of public ownership within the watershed, we do not feel stream access is confined. Location and acreage of this public frontage is listed below

<u>T</u>	<u>R</u>	<u>Sec.</u>	<u>Acreage</u>
9N	11W	30	43
9N	11W	23	80
9N	11W	23	16 (Stegeman Creek)
9N	11W	22	74
8N	11W	22, 23	<u>12</u>
225 acres			

Page II-62, paragraph 1

The correct size of the Rogue River State Game Area is 5,600 acres. Also, we know of only one park in the watershed, that being at Long Lake.

Page II-83, paragraph 2

It is stated that sediment buildup behind the two downstream dams will be reduced by 47 percent. It should be stated that one of these dams, the Childsdale Dam, is expected to be removed during 1975 and 1976.

Page II-85, structural measures, paragraph 1

It is stated that the average annual acres flooded will be reduced by 92 percent. Over what period of time would this occur.

Page II-93, paragraph 4

Considering that the people of the county have contributed \$1 million to the project, and the general public another \$1.8 million has there been any consideration of public hunting and fishing along the channels after they are stabilized?

We hope that these comments will be helpful in the preparation of the final EIS on this project.

Sincerely,

G-14

Howard A. Tanner
Howard A. Tanner
Director

